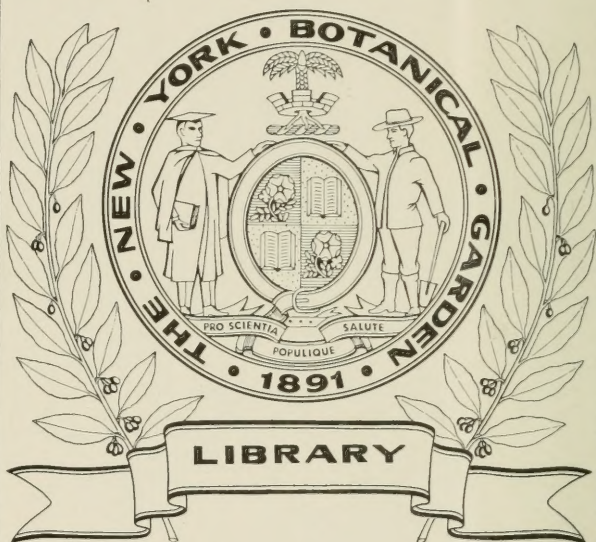


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CYANEA CARLSONII ROCK AND THE UNNATURAL DISTRIBUTION OF
SPHAGNUM PALUSTRE L.

Otto & Isa Degener and Hans Hörmann

Invited by retired Forester L. W. Bryan (*) to see Cyanea carlsonii, described by J. F. Rock (**), the Degeners and National Park Ranger T. L. Picco and wife left the Volcano area for an overnight stay in the village of Captain Cook, District of Kona, Island of Hawaii. Early on May 30, 1969, Col. Bryan led them for miles along private jeep roads chiefly at elevations between 2,000 and 5,000 feet in the Honaunau Forest Reserve. Here three healthy Carlson (***) cyanea, two to three meters tall, could be studied in the open rainforest, one protected from cattle by being on the safe side of a fence. In the neighborhood was the remains of a specimen, apparently dead of old age, consisting of a single, almost erect stem ten meters tall. This species is palm-like in habit, bearing at the end of its single leaf- and inflorescence-scarred trunk a crowded tuft of short-petioled (hardly "sessile"), linear-oblongate leaves up to 70 cm. long and 10 cm. wide. When such plants are decapitated they either produce a few adventitious branches to continue an unnatural growth, or more likely die. One plant studied bore several branches which we relieved of three leaves, though we augmented our supply for museum specimens by retrieving several dead ones from the ground. The type plant, it was related, shown to a visiting California botanist who surreptitiously bagged its single stem for a museum specimen, unfortunately had died! The species evidently is on the verge of extinction.

Two species of sphagnum are known from the Hawaiian Islands. One is Sphagnum wheeleri C. Mull., an endemic limited to the Hawaiian Islands and known to Bartram (****) only from three collections coming from bogs at higher elevations of West Maui: two from Mt. Eke (C. N. Forbes; Degener & Wiebke, in 1927) and a third from the Honokohau drainage basin (C. N. Forbes).

The other sphagnum known from this archipelago is S. palustre L., a cosmopolitan moss with Europe as the type locality. This was known to Bartram only from the District of Kohala, Island of Hawaii. The occasional reports ascribing this sphagnum to other areas of the Hawaiian Islands, unless a voucher specimen exists, we hardly take seriously as one of the three native "white fork mosses" of the genus Leucobryum could easily be mistaken for a sphagnum by an amateur. In fact, as recently as September, 1968, National Park Ranger Ralph Harris asked about a sphagnum on the Island of Maui. As he wisely submitted a voucher specimen that proved to be, not a Leucobryum, but a Rhizogonium, we could scotch that rumor quickly.

The senior writer decades ago collected abundant material of

Sphagnum palustre along the plateau at the head of Waipio Valley, District of Kohala, of which exsiccatae have been widely distributed; and both Degeners have admired the masses of sphagnum, conspicuously blanketing the plateau bog and the edge of the pali, or cliff, with pale yellow whenever flying over this same region.

On the return trip, after admiring the cyanea, the Degeners were elated to find a sphagnum along the rainforest road, growing in healthy tufts among bushes and sparse grass. Their elation at apparently discovering a new sphagnum or at least a new station for S. palustre forty-two miles distant as the crow flies from Waipio was premature. Col. Bryan explained that sphagnum was harvested as early as 1919 above Waipio as it was cheaper getting this native supply than importing sphagnum from the Mainland, with the additional benefit that local material would be free of troublesome exotic weed seeds. To harvest this heavy moss, it was merely passed through an old-fashioned clothes wringer to free it of water before hauling to the government nursery in Hilo for storing. This supply was used for enbaling earth-free seedlings of exotic timber trees before carrying them into the jungle for planting. The moss we found on May 30, 1969, evidently grew from material used in packing seedlings of various species of Pinus, Toona, of Fraxinus uhdei, etc., to this general area between 1962 and 1964. Whether the sphagnum became naturalized in this new station from spores or from desiccated, dormant gametophyte fragments, or both, we do not know.

To verify that the collection (Degeners & Bryan 31,954) was truly S. palustre, it was carefully studied by modern methods: The stem is up to 18 cm. long though often only 5-7 cm., stiff but fragile, in cross section having a reddish brown woody cylinder bearing three layers of fibrillose cortical cells of which the outer have 1 pore. Stem leaves broadly lingulate, very concave, 2.2 mm. long, 1.0 mm. wide; margins from apex to near rounded base eroded; hyaline cells fibrillose except at apex. Branch leaves broadly ovate, 2.7 mm. long, 1.5 mm. wide, very concave; margins inflexed; apex cucullate and rough by projecting cells; many big pores in corners of hyaline cells and all fibrillose; chlorophyll cells in cross section narrow-elliptic to -trapezoidal with the wider base exposed on inner surface of leaf. Even though the specimens were sterile, the above description coincides specifically with S. palustre L., as occurring in Europe.

We mention this find of our native, but not endemic, sphagnum lest botanical workers confuse the natural with the "unnatural" range of S. palustre on the Island of Hawaii. This species, incidentally, can readily be distinguished from S. wheeleri C. Müll. by the leaves rough at the back of the apex and the fibrillose cortical cells of stem and branches.

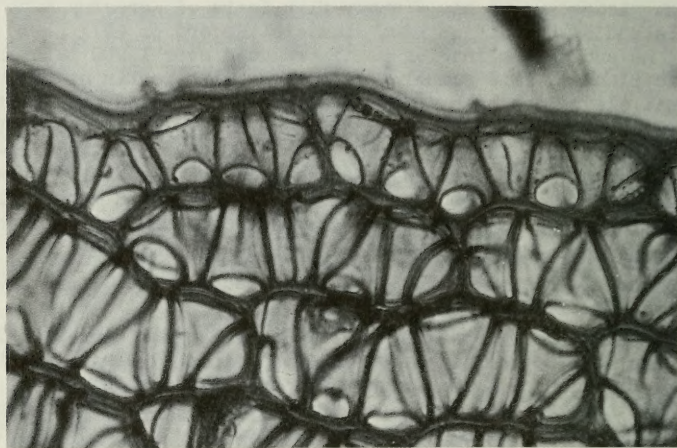
*Lester W. Bryan was born in Boston, Massachusetts, in 1895. After a year during World War I in Europe, he later engaged in

engineering in California. He arrived in Honolulu on May 1, 1921; and soon held the dual position of forester in charge of the extensive Hawaiian Sugar Planters Association Forest Reserves on the Island of Hawaii, and Forestry officer for the Territory of Hawaii. When the Association discontinued its forestry program in 1949, he continued at Territorial and later State Forester until his retirement in 1961. This was full time except for the interruption of World War II when Col. Bryan was assigned various duties in the Pacific, the last being that of Commanding Officer of Christmas Island. He is largely responsible for the introduction of exotic timber trees, as well as fruit trees and ornamentals, thus changing the aspect of the Hawaiian Islands in many areas. According to his "Twenty-five Years of Forestry Work on the Island of Hawaii" in Haw. Planters' Record 51 (1): 1--80. 1947, he and his colleagues had introduced over 1,200 taxa of exotic plants. This pamphlet describes, with pertinent remarks, at what elevations each surviving taxon was planted; and whether its vigor was excellent, good, fair, or poor. We emphasize the existence of this forestry work because of its importance regarding plant introductions, introductions not generally known to the botanist. Since that time he has introduced many additional exotics, such as Metasequoia glyptostroboides, for which he maintains up-to-date records for eventual publication.

**Rock, J. F., in B. P. Bishop Mus. Occas. Pap. 22 (5): 60--63, fig. 14. 1957.

***Norman K. Carlson in 1949--1953 was Range Conservationist with the Soil Conservation Service, and since 1953 has been head of the Division of Agriculture and Forestry of the Bernice Pauahi Bishop Estate. Dr. Rock described the new species from sterile material. Mr. Carlson cultivated one of the plants in his garden, at length getting the unknown flowers and fruit. Rock described these structures in the B. P. Bishop Mus. Occas. Pap. 23 (5): 70, fig. 3, August 17, 1962. Note that Dr. F. E. Wimmer died on May 2, 1961, predeceasing his friend Rock who died on December 5, 1962; yet Wimmer described the flowers and fruit posthumously, unless, of course, Dr. K. H. Rechinger did so for him when completing the manuscript for publication, in "Das Pflanzenreich" in 1968.

****Bartram, E. B., Manual of Hawaiian Mosses, pp. 11, 12. 1933.



Part of branch leaf of Sphagnum palustre L., showing
hyaline, fibrillose cells with large pores,
X 600

ADDITIONAL NOTES ON THE ERIOCAULACEAE. XXIV

Harold N. Moldenke

So much additional information and so many additional specimens have become available to me, and so many errata have accumulated since this series of notes was initiated that it seems desirable to interrupt the continuation of the alphabetic sequence by recording the additions and corrections applying to groups and taxa thus far covered.

ERIOCAULACEAE Lindl.

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Additional bibliography: Walp., Ann. 1: 890. 1849; Moldenke, Phytologia 18: 74. 1969.

ELASTOCAULON RUPESTRE (Gardn.) Ruhl.

Additional bibliography: Walp., Ann. 1: 890. 1849; Moldenke, Phytologia 18: 165. 1969.

CARPTOTEPALA Moldenke

Additional bibliography: Moldenke, Phytologia 17: 374--376

(1968) and 17: 507. 1969; Moldenke, Biol. Abstr. 50: 2584. 1969.

COMANTHERA L. B. Sm.

Additional bibliography: Moldenke, Phytologia 17: 450 (1968) and 17: 502. 1969; Moldenke, Biol. Abstr. 50: 2584. 1969.

COMANTHERA KEGELIANA (Körn.) Moldenke

Additional bibliography: Moldenke, Phytologia 17: 376—377. 1968.

Robertson & Austin collected this plant in white sand areas, flowering and fruiting in June. Material has been misidentified and distributed in herbaria as Syngonanthus gracilis (Körn.) Ruhl.

Additional citations: GUYANA: Robertson & Austin 268 (N).

ERIOCAULON Gron.

Emended synonymy: Cespa Hill, Herb. Brit. 1: pl. 66 [some copies]. 1769. Eriocaulon Auct. (in part) apud Stapf, Ind. Lond. 3: 90, in syn. 1930.

Additional & emended bibliography: Petiv., Mus. 796. 1695; Pluk., Alm. Bot. 3: 366, pl. 21, fig. 7. 1696; K. Comm., Fl. Malab. 67. 1696; Rheed., Hort. Malab. 12: 129, pl. 68. 1703; Petiv., Class. & Topic. Cat. 344. 1706; H. Herm., Mus. Zeyl., ed. 1, 7—8 & 20 (1717) and ed. 2, 17. 1726; J. Burm., Thes. Zeyl. 108 & 109. 1737; Amm., Stirp. Rar. [Herb.] 396, pl. 21. 1739; L., Fl. Zeyl., ed. 1, 20—21 (1747) and ed. 2, 20—21. 1748; L., Sp. Pl., ed. 1, pr. 1, 1: 87 (1753) and 2: [1203] (1753) and ed. 2, 1: 128—129. 1762; Grantz, Inst. Rei Herb. 1: 360. 1766; Burm. f., Fl. Ind. 30, pl. 9, fig. 1. 1768; Pluk., Alm. Bot. pl. 409, fig. 5. 1769; J. Hill, Herb. Brit. 1: pl. 66 [some copies]. 1769; Hope, Phil. Trans. Roy. Soc. Lond. 59: 241—245, pl. 12. 1770; Pennant, Tour Scotl. & Voy. Hebrides 1: pl. 39. 1774; Lour., Fl. Cochinch., ed. 1, 60—61. 1790; Lam., Tabl. Encycl. [Ill.] 1: 212—214, pl. 50, fig. 1—4. 1791; Gaeetn., Fruct. & Sem. Pl. 2: 14, pl. 83. 1791; Lour., Fl. Cochinch., ed. 2, 76—77. 1793; Rottb., Descr. Pl. Surin. pl. 1 & 2. 1798; J. E. Sm. in Sowerby, Engl. Bot. 11: pl. 733. 1800; J. E. Sm., Pl. Brit. 3: 1009—1010. 1804; J. E. Sm. in Rees, Cycl. 13: Eriocaulon. 1809; J. E. Sm., Compend. Fl. Brit., ed. 1, 132, 140, & 191. 1816; Pursh, Fl. Am. Sept. 1: 92. 1816; Thunb., Pl. Bras. 1: pl. 1. 1817; J. E. Sm., Compend. Fl. Brit., ed. 3, 132, 140, & 191. 1818; Poir. in Cuvier, Dict. Sci. Nat. 15: 187. 1819; Svensk. Vet. Akad. Handl. 1820: pl. 3 & 4. 1820; Hook., Fl. Scot. 1: 256, 270, & [294] (1821) and 2: 179 & [300]. 1821; Curtis, Fl. Lond., ed. 2, 4: pl. 52. 1821; Poir. in Cuvier, Dict. Sci. Nat. 24: 239—241. 1822; J. E. Sm., Compend. Fl. Brit., ed. 5, 145, 155, & 209. 1828; J. E. Sm., Engl. Fl. 4: 56—57, 139—140, 355, & 356. 1828; J. E. Sm., Compend. Engl. Fl., ed. 1, 165, 176—177, 203, & 213. 1829; P. F. J. Turpin in Cuvier, Dict. Sci. Nat. [63]: Planch. Bot. Monocot. 2, pl. [41]. 1829; Hook., Brit.

Fl., ed. 1, 404--405, 470, & 479 (1830) and ed. 2, 402, 468, & 479. 1831; Bong., Mém. Acad. Imp. Sci. St. Pétersb., sér. 6, 1: 1--74 & 601--656, pl. 1--19 & 39 (1831) and 2: 219--238, pl. 11--19. 1832; Beck, Bot., ed. 1, 369--370 & 467. 1833; Hook., Brit. Fl., ed. 3, 408, 488, & 499. 1835; Mart., Nov. Act. Acad. Leopold.-carol. Nat. Cur. 17 (1): 1--72, pl. 1. 1835; Bong., Mém. Acad. Imp. Sci. St. Pétersb., sér. 6, 3: 545--560, pl. 20--27. 1835; Mackay, Fl. Hibern. 1: xcdi, [xxvii], & 288--289 (1836) and 2: 263 & 270. 1836; J. E. Sm., Compend. Engl. Fl., ed. 2, 178, 190, 219, & 228. 1836; Delessert, Icon. Pl. 3: pl. 95--98. 1837; Lesson in Bougainville, Journ. Navig. Autour Globe 2: 348--351, pl. 46. 1837; Hook., Brit. Fl., ed. 4, 346, 436, & 447. 1838; Bong., Mém. Acad. Imp. Sci. St. Pétersb., sér. 6, 5: pl. 28a--35. 1839; M. E. Jacks., Pict. Fl. fig. 1387. 1840; Hook., Brit. Fl., ed. 5, xcdi, xcdii, 353--354, & 456. 1842; Hook., Lond. Journ. Bot. 1: pl. 13. 1842; Baxt., Brit. Bot., ed. 2, 6: pl. 465. 1843; Schnitzl., Iconogr. 1: pl. 46. 1845; Deakin, Florigr. Brit. 3: fig. 1457. 1847; Beck, Bot., ed. 2, pr. 1, 370 & 475. 1848; Walp., Ann. 1: 890 & 891. 1849; Hook. & Arn. in Hook., Brit. Fl., ed. 6, 445--446 & 595. 1850; Griff., Icon. Pl. Asiat. pl. 160. 1851; Walp., Ann. 3: 663 (1852) and 3: 1014. 1853; Hook. & Arn. in Hook., Brit. Fl., ed. 7, 458 & 606. 1855; Beck, Bot., ed. 2, pr. 2, 370 & 475. 1856; B. Clarke, Trans. Linn. Soc. Lond. Bot. 22: 402, 405, & 410, pl. 68, fig. 11--15. 1859; Hook. & Arn. in Hook., Brit. Fl., ed. 8, 459, 617, & 634. 1860; Johnson & Sowerby, Brit. Wild Fls. fig. 1303. 1860; C. Müll. in Walp., Ann. 5: 922--947 & 954. 1860; A. W. Chapm., Fl. South. U. S., ed. 1, pr. 1, 503--504 & 609. 1860; C. Müll. in Walp., Ann. 6: 1170--1171. 1861; T. Moore, Field Bot. Comp. pl. 24. 1862; Körn. in Mart., Fl. Bras. 3 (1): [271]--508, pl. 38--63. 1863; Benth., Handb. Brit. Fl. fig. 1066. 1865; A. W. Chapm., Fl. South. U. S., ed. 1, pr. 2, 503--504 & 609. 1865; Le Maout & Decne., Trait. Gén. Bot. 597--598. 1868; Beck, Bot., ed. 2, pr. 3, 370 & 475. 1868; Syme, Engl. Bot. 10: pl. 1546. 1870; A. W. Chapm., Fl. South. U. S., ed. 1, pr. 3, 503--504 & 609. 1872; Pratt, Flow. Pl. Grasses Sedges & Ferns Gr. Brit., ed. 3, 5: pl. 228. 1873; Hook. in Le Maout, Decne., & Hook., Gen. Syst. Bot. 872--873. 1873; Iinouma, Somoku Dzusetsu, ed. 2, 17: pl. 49 & 50. 1874; Hogg & Johnson, Wild Fls. Gr. Brit. 11: pl. 894. 1880; A. W. Chapm., Fl. South. U. S., ed. 2, pr. 1, 503--504, 681, & 687 (1883), ed. 2, pr. 2, 503--504, 681, & 687 (1884), and ed. 2, pr. 3, 503--504, 681, & 687. 1887; Wawra, Itin. Princ. S. Coburg. 2: 96, pl. 12. 1888; A. W. Chapm., Fl. South. U. S., ed. 2, pr. 4, 503--504, 658, 681, 687, & 696 (1889) and ed. 2, pr. 5, 503--504, 711, & 718. 1892; Maxim., Dec. Pl. Asiat. 8: 7, 9, 21, & 22. 1893; Masses, Grevillea 22: 67. 1894; Baillon, Hist. Pl. 12: [397]--402. 1894; Useful Pl. Jap. 3: pl. 966. 1895; A. W. Chapm., Fl. South. U. S., ed. 3, 529--530, 648, & 652. 1897; Rendle, Cat. Afr. Pl. Welw. 2 (1): 95--102. 1899; N. E. Br. in Thiselt.-Dyer, Fl. Trop. Afr. 8: 245--257. 1901; G. P. Clinton, Rhodora 3: 79--82, fig. 1 & 2. 1901; G. P. Clinton, Journ. Myc. 8: 137. 1902; Collett, Fl. Siml. 550. 1902; Wettst., Veg. Süd-

bras. pl. 56 & 57. 1904; Banks & Soland., Bot. Cook's Voy. 3: pl. 317. 1905; F. M. Bailey, Weeds & Poison. Fl. Queensl. 207. 1906; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 158 & 501. 1906; Alv. Silv., Fl. Serr. Min. 33—34, pl. 10 & 11. 1908; Beauverd, Bull. Herb. Boiss., sér. 2, 8: 284—287, 293, 295, & 299, fig. 9 A & B. 1908; Hochr., Ann. Conserv. & Jard. Bot. Genève. 11/12: 51. 1908; Engl. & Drude, Veget. Erde 9 (2): 263—265. 1908; H. Lecomte, Journ. de Bot. 21: 86—94, [101]—109, & [129]—136, fig. 1—3. 1908; Praeger, Tour. Fl. W. Ireland pl. 6. 1909; Beauverd, Bull. Herb. Boiss., sér. 2, 8: 986—988, fig. 1. 1909; Karst. & Schenck, Veg.-Bild. 3: pl. 31. 1910; Mak., Bot. Mag. Tokyo 24: 166. 1910; Praeger, Journ. Roy. Hort. Soc. Lond. 36: 302, fig. 107. 1910; Wettst., Handb. Syst. Bot., ed. 2, 814. 1911; Hosseus, Beih. Bot. Centralbl. 28 (2): 372—373. 1911; W. Stone, Ann. Rep. N. J. State Mus. 1910: [Pl. South. N. J.] 323—325 & 817, pl. 28, fig. 1 & 2, & pl. 64, fig. 2. 1912; Mak., Somoku Dzusetsu [Iconogr. Fl. Nippon] 17: pl. 48—50. 1912; H. Lecomte, Fl. Gén. Indo-Chine 7: [1]—18. 1912; F. M. Bailey, Compreh. Cat. Queensl. Fl. 584, 586, & 859, fig. 564—566. 1913; Hayata, Icon. Fl. Formos. 3: 197. 1913; Nakai in Matsumura, Icon. Fl. Koisikav. 2: 35—47, pl. 102—108. 1914; H. N. Ridl., Journ. Fed. Malay States Mus. 6: 191—192. 1915; Horwood, Pl. Life Brit. Isles 3: 340. 1915; Marloth, Fl. S. Afr. 4: 66. 1915; Fyson, Fl. Nilg. & Puln. Hill-tops 1: 426—432, pl. 272—277. 1915; R. E. Fr., Wiss. Ergebn. Schwed. Rhod.-Kong.-Exped. 1911—12 Bot. 1: 218, pl. 16. 1916; Ewart & Cookson in Ewart & Davies, Fl. N. Terr. 67 & 366, pl. 6. 1917; Fitch. & Sm., Ill. Brit. Fl., rev. ed. 4, iss. 2, fig. 1082. 1919; Hayata, Icon. Pl. Formos. 10: 49—56 & 272, fig. 27—31. 1921; Fyson, Fl. Nil. & Puln. Hill-tops 3: 118—119, pl. 543. 1921; Stapf, Ind. Lond. 3: 90—91. 1930; Sasaki, Cat. Govt. Herb. 118—119 & 532. 1930; Mayebar, Fl. Austr.-higo 77. 1931; Sprague, Kew Bull. Misc. Inf. 1933: 385. 1933; Van Steenis, Trop. Natuur 25: 2 & 107. 1936; Sugawara, Pl. Saghal. 117. 1937; Sugawara, Illustr. Fl. Saghal. 2: 517, pl. 241. 1939; Karling, Torreya 41: 106. 1941; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 2, 158 & 501. 1941; Robyns & Louis, Verhandl. Konink. Acad. Wetensch. Belg. 4 (3): 61. 1942; Backer, Noodfl. Java 10a: fam. 214: 1. 1949; Van Steenis, Bull. Jard. Bot. Buitenz., sér. 3, 18: 460—461. 1950; Markgraf, Veröffentl. Geobot. Forschungsinst. Rübel Zürich 25: 143—146. 1952; Heslop-Harrison, Biol. Abstr. 27: 984. 1953; Faegri, Biol. Abstr. 27: 1272. 1953; E. J. Salisb., Ind. Kew. Suppl. 11: 38, 88, 157, & 272. 1953; [Wiltshire], Rev. Appl. Myc. Ind. Fungi 1: 39, 50, & 393. 1954; Anon., Trav. Lab. Bot. Syst. Brux. 16: 32. 1955; Anon., Assoc. Etud. Fl. Afr. Trop. Index 1954: 34. 1955; E. Müll., Phytopath. Zeitschr. 23: 108—109. 1955; J. N. Mishra, Mycologia 48: 407 & 408. 1956; Viennot-Bourgin, Bull. Soc. Bot. France 104: 271 & 273—275, fig. 2 D & 3. 1957; Hoogland, Blumea Suppl. 4: 221. 1958; J. T. Koster, Blumea Suppl. 4: 272. 1958; Van Royen, Nova Guinea, new ser., 10: 35. 1959; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 158 & 501. 1959; Van Royen, Blumea 10: [126]—135, fig. 1. 1960; Van

Royen, Nova Guinea, new ser., 10: 236 & 467. 1960; D. N. F. Kiehl, Blumea 10: 657; Van Royen, Blumea 11: [224]—225, fig. 1. 1961; Clapham, Tutin, & Warburg, Fl. Brit. Isles, ed. 2, 962. 1962; Perring & Walters, Atlas Brit. Fl. 311, map A.582/1. 1962; Moldenke, Bol. Soc. Venez. Cienc. Nat. 23: 99—100. 1962; [Wiltshire], Rev. Appl. Myc. Ind. Fungi 2: 327, 329, 355, 356, 359, 404, 410, & Cum. Ind. 202. 1963; Griffith & Hyland, U. S. Dept. Agr. Pl. Inventory 166: 184 & 386. 1966; Brunel, Morency, & Venne, Ann. Assoc. Canad. Franc. Adv. Sci. 32, Bot. 6: 54. 1966; K. Larsen, Dansk Bot. Ark. 23: 378—381 & 397. 1966; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 168, 223, 224, 349, 396, 417, 418, 620, 647, 758, 950, 1057, 1091, & 1092. 1966; Cave, Madrofia 19: 134. 1967; Boivin & Cayouette, Nat. Canad. 94: 524. 1967; Dandy, Ind. Gen. Vasc. Pl. 38, 48, & 96. 1967; F. Rose, Irish Naturl. Journ. 15: 361. 1967; Sculthorpe, Biol. Aquat. Pl. 23, 389—391, 393, 394, & 578. 1967; Stafleu, Tax. Lit. 13, 137, & 144. 1967; Ornduff, Reg. Veg. 50: 39 & 120 (1967) and 55: 13, 113, & 118. 1968; Astle, Kirkia 7: 93 & 95. 1968; W. C. Grimm, Recog. Flow. Wild Pl. 36—37. 1968; Backer & Bakh., Fl. Java 3: 25—26. 1968; Aristeguieta, Act. Bot. Venez. 3: 25. 1968; J. A. Steyerma., Act. Bot. Venez. 3: 96. 1968; Moldenke, Biol. Abstr. 50: 2584. 1969; Moldenke, Phytologia 18: 165—186, 243—280, 295—328, 342, 344—396, 422—451, 504, 506, & 507. 1969; F. C. Seymour, Fl. N. Engl. 171. 1969; Tatew. & Ishizuka, Sapp. Bull. Bot. Gard. Hokk. Univ. 2: 21, 22, 25, 30, 45, & 55. 1969; Ornduff, Reg. Veg. 59: 32 & 116. 1969; Brummitt & Ferguson, Reg. Veg. 61: 107. 1969; Rogerson, Rickett, & Becker, Bull. Torr. Bot. Club 96: 387. 1969; A. L. Moldenke, Phytologia 18: 501. 1969.

It should be noted that the generic name, Cespa Hill, goes back to J. Hill's "Herbarium Britannicum" (1769), not to his "British Herbal" (1756) as is sometimes erroneously stated, and the name possibly occur only in one copy of this work!

Fyson (1915) gives the following interesting key to the species of Eriocaulon known to him from the Nilgiri and Pulney hilltops, with the nomenclature brought up-to-date:

1. Heads 13 mm. or more in diameter; scapes about 30 cm. tall.
 2. Leaves thick, smooth; heads thick.....E. robustum Steud.
 - 2a. Leaves hairy; heads flat; involucre bractlets black....
E. nilagirens Steud.
 - 1a. Heads under 13 mm. in diameter; scapes 15 cm. tall or less.
3. Scapes tufted.
 4. Scapes 10—15 cm. tall; involucre bractlets black; receptacle villous.
 5. Leaves flat, weak; heads gray...E. collinum Hook. f.
 - 5a. Leaves firm, narrow, canaliculate above; heads white.....E. christopheri Fyson.
 - 4a. Scapes 2.5—6.5 cm. tall; involucre bractlets brown.....E. thwaitesii Körn.
 - 3a. Scapes solitary.

6. Involucre black.....E. leucomelas Steud.

6a. Involucre white.....E. oliveri Fyson.

Mishra (1956) records the fungus, Ustilago jagdishwari Mishra, from the ovules of an unidentified species of this genus in Bihar, India.

ERIOCAULON ABYSSINICUM Hochst.

Additional bibliography: Walp., Ann. 1: 891. 1849; C. Müll. in Walp., Ann. 5: 926 & 933 (1860) and 6: 1170. 1861; Rendle, Cat. Afr. Pl. Welw. 2 (1): 97 & 98. 1899; Moldenke, Phytologia 17: 477. 1969; Moldenke, Biol. Abstr. 50: 2584. 1969.

The initial letter of the specific epithet of this species is uppcased by Walpers (1861). Rendle (1899) states that E. cil-
iisepalum Rendle [now known as E. gilgiamum Ruhl.] and E. wel-
witschii Rendle are closely related to E. abyssinicum, as well as to an "E. sp.", based on Welwitsch 2451, which he describes as follows: "Perhaps a new species near E. abyssinicum, distinguish-
ed by its much broader triangular-subulate, fenestrate leaves. Flower-heads with whitish involucre and blackish discs; flowers trimerous but too young for more certain determination. Huilla. — In lofty short-grassed pastures flooded in the rainy season at Morro de Lopollo, growing with small Xyrideae and Cyperaceae but not plentiful. March and April 1860."

ERIOCAULON ACHITON Körn.

Additional & emended bibliography: C. Müll. in Walp., Ann. 5: 926 & 937 (1860) and 6: 1170. 1861; H. Lecomte, Journ. de Bot. 21: 93 & 108. 1908; Bourdu, Bull. Soc. Bot. France 104: 156. 1957; K. Larsen, Dansk. Bot. Ark. 23: 379—381 & 397, fig. 4—6. 1966; Ornduff, Reg. Veg. 55: 13 & 118. 1968; Moldenke, Phytologia 18: 167 & 428. 1969.

Illustrations: K. Larsen, Dansk. Bot. Ark. 23: 380, fig. 4—6. 1966.

Larsen (1966) says that "This species has a very restricted range. Originally described from Khasia Hills in India it has later on been found in Northern and Central Thailand and in Vietnam. The determination of the chromosome number was not easy. Flower buds of both strains were fixed. While the material of No. 6304 showed no usable meiotic metaphase, some good somatic divisions were observed and could be counted with great certainty at $2n = 30$ (Fig. 6). In No. 6071 meiotic metaphases were present but probably the fixation was not very successful, in any case the chromosomes showed some degree of stickiness. In some cases the number $n = 16$, in others $n = 15$ were counted. Figs. 4—5 show two such difficult spots as indicated by an arrow. The somatic chromosomes are small, rod-shaped and all of nearly the same size."

Material of this species has been misidentified and distributed in herbaria under the name E. sexangulare Auct.

Additional citations: PAKISTAN: East Bengal: W. Griffith

5576 (Mu—302, Mu—312). THAILAND: Hosseus 306a (Mu—407).

ERIOCAULON AFRICANUM Hochst.

Additional bibliography: Walp., Ann. 1: 891. 1849; C. Müll. in Walp., Ann. 5: 926 & 940 (1860) and 6: 1170. 1861; Marloth, Fl. S. Afr. 4: 66. 1915; Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 18: 167 & 279. 1969.

Illustrations: Marloth, Fl. S. Afr. 4: 66. 1915.

The initial letter of the specific epithet of this species is uppcased by Walpers (1861).

ERIOCAULON AFZELIANUM Wikstr.

Additional synonymy: Eriocaulon alzeliamm Wik-tz. apud Viennot-Bourgin, Bull. Soc. Bot. France 104: 273, sphalm. 1957.

Additional bibliography: C. Müll. in Walp., Ann. 5: 926 & 945 (1860) and 6: 1170. 1861; Viennot-Bourgin, Bull. Soc. Bot. France 104: 275. 1957; [Wiltshire], Rev. Appl. Myc. Ind. Fungi 2: 404, 410, & Cum. Ind. 202. 1963; Moldenke, Phytologia 18: 167. 1969.

Viennot-Bourgin (1957) describes the fungus, Tolyposporella eriocaulonis Viennot-Bourgin, from this species of pipewort in French Guinea, and compares it with Tolyposporium eriocauli Clint. and Ustilago eriocauli Clint., both of which are known to attack other species of pipewort elsewhere. Wiltshire (1963) changes the name of the fungus to Tolyposporella eriocauli Viennot-Bourgin.

Additional & emended citations: SÉNÉGAL: J. G. Adam 15947 (Mu), 16968 (Rf), 18477 (Ac). NIGERIA: Northern: C. Barter 1019 (Mu—298).

ERIOCAULON ALATUM H. Lecomte

Additional & emended bibliography: H. Lecomte, Journ. de Bot. 21: 102, 104--105, 132, 133, & 136, fig. 1 & 2. 1908; H. Lecomte, Fl. Gén. Indo-Chine 7: 3 & 17--18, fig. 2. 1912; Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 17: 478 (1969) and 18: 303. 1969.

Additional & emended illustrations: H. Lecomte, Journ. de Bot. 21: 105 & 132, fig. 1 & 2. 1908; H. Lecomte, Fl. Gén. Indo-Chine 7: 18, fig. 2. 1912.

Recent collectors have found this plant growing on high plateaus, flowering and fruiting in January and August.

The Loher 1602, cited below, is a mixture with something in the Cyperaceae. The Loher 6987 specimen in the Munich herbarium was originally numbered "6897" on its label, but this number was apparently later changed to "6987", which, presumably, is correct.

Material of this species has been misidentified and distributed in herbaria as E. truncatum Hamilt.

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Luzon: Loher 1602, in part (Mu—379, W—389001); M. Ramos s.n. [Herb. Philip. Bur. Sci. 1831] (W—626710). Island unde-

terminated: Loher 6987 (Mu—406). INDONESIA: GREATER SUNDA ISLANDS: Sumatra: H. H. Bartlett 7456 (W--1552242).

ERIOCAULON ALPESTRE Hook. f. & Thoms.

Additional synonymy: Eriocaulon limosum Sieb. & Zucc., in herb. [not E. limosum Engl. & Ruhl., 1899]. Cephalaria caespitosa Bürger, in herb.

Additional bibliography: Mak., Bot. Mag. Tokyo 8: 506—507. 1894; Komarov, Fl. Mansh. 1: 419. 1901; C. W. Wright, Journ. Linn. Soc. Lond. Bot. 36: 198. 1903; H. Lecomte, Journ. de Bot. 21: 89 & 92. 1908; H. Lecomte, Fl. Gén. Indo-Chine 7: 2 & 10. 1912; Hayata, Icon. Pl. Formos. 10: 52, 56, & 272. 1921; Sasaki, Cat. Govt. Herb. 118. 1930; Van Royen, Blumea 10: [126]—129. 1960; D. N. F. Kiehl, Blumea 10: 657. 1960; Moldenke, Phytologia 18: 167, 246, 249, 274, 440, & 442. 1969.

This binomial, Eriocaulon alpestre, was validly published first by Körnicke in Miq., Ann. Mus. Bot. Lugd. 3: 163 (1867), but again, as though for the first time, by Hooker in his Fl. Brit. Ind. 6: 578 (1893), in each case with the same accreditation to "Hook. f. & Thoms." Both the cheironymous names, E. limosum Sieb. & Zucc. and Cephalaria caespitosa Bürger, were apparently based on the Bürger s.n. specimen deposited in the herbarium of the Botanische Staatssammlung at Munich, a specimen which Ross suggests may be E. miquelianum Maxim., but with which identification I do not at all concur.

A "pl. 6D" is sometimes cited for this species, but is not so recorded by Stapf (1930).

Additional citations: INDIA: Khasi States: Hooker & Thomson s.n. [Mont. Khasia, 5—6000 ped.] (Mu—178). Sikkim: J. D. Hooker s.n. [Sikkim, 8—12,000 ped.] (Mu—179). WESTERN PACIFIC ISLANDS: JAPAN: Island undetermined: Bürger s.n. [In Japonia] (Mu—212).

ERIOCAULON ALPESTRE var. AMPULLARIUM Van Royen

Bibliography: Van Royen, Blumea 10: [126]—129, fig. 1A. 1960; D. N. F. Kiehl, Blumea 10: 657. 1960.

Illustrations: Van Royen, Blumea 10: 129, fig. 1A. 1960.

The type of this variety is Santos 31727, collected on the island of Luzon in the Philippines.

ERIOCAULON ALPINUM Van Royen

Additional bibliography: Van Royen, Blumea 10: 128 & 130. 1960; Moldenke, Phytologia 18: 77. 1969.

ERIOCAULON ALTOGIBBOSUM Ruhl.

Additional & emended bibliography: Ruhl. in Pilg., Engl. Bot. Jahrb. 30: 146. 1901; Moldenke, Phytologia 17: 478—479. 1969.

The Ruhland paper (1901) cited in the bibliography above is often erroneously cited as "1902", but was actually issued on July 2, 1901 — the "1902" is merely the volume title-page date.

ERIOCAULON AMBOENSE Schinz

Additional bibliography: Moldenke, *Phytologia* 18: 77, 97, 180, & 245. 1969.

Friedrich-Holzhammer (1967) cites Giess & Leippert 7608, Merxmüller & Giess 2079b & 2134, and Schinz 859 from Southwest Africa. The last-mentioned collection is actually the type collection of the species. I have seen Giess & Leippert 7608 and regard it as E. heudelotii N. E. Br.

Additional & emended citations: RHODESIA: Hornby H.2388 [Govt. Herb. Salisbury 13417] (F—photo, N—photo, Rh, Rh, Sg—photo, Z—photo); H. Wild 1162 [Govt. Herb. Salisbury 15100] (N, Rh). SOUTHWEST AFRICA: Baum 111 (Ac); Merxmüller 2079b (Mu), 2134 (Mu, Mu, Mu).

ERIOCAULON AMPHIBIUM Rendle

This taxon has been reduced to synonymy under E. pictum Fritsch, which see.

ERIOCAULON ANDONGENSE Welw.

Additional & emended bibliography: Rendle, *Cat. Afr. Pl. Welw.* 2 (1): 100. 1899; Moldenke, *Phytologia* 17: 479. 1969.

Rendle (1899) says of this species: "Near E. transvaalicum N. E. Br., but distinguished by its lighter flower-heads, glabrous bracts and perianth-leaves, broader sepals of female flower, etc." He bases it on three collections of Welwitsch: (1) no. 2442, growing gregariously in spongy places on the higher rocks of Pedra de Cazamba in the province of Pungo Andongo, in the beginning of May, 1857; (2) no. 2443, rather plentiful in spongy rocky places by springs on the huge rocks toward the south of the province of Fonte de Salgado, Pungo Andongo, in the middle of April, 1857; and (3) no. 2443b, in wet places by the cataract of Condo (de Estefania), Pungo Andongo, not yet in flower in March, 1857. These localities are apparently in what is now called the province of Loanda.

Volk notes of this plant "In trockened Chamaegigas-Wanner häufig, gesellig." It has been collected in flower and fruit in April and May.

Additional citations: ANGOLA: Loanda: Welwitsch 2443 (Mucotye). SOUTHWEST AFRICA: Volk 3004 (Mu).

ERIOCAULON ANGUSTIFOLIUM Körn.

Additional bibliography: C. Müll. in *Walp., Ann.* 5: 931 (1860) and 6: 1170. 1861; Moldenke, *Phytologia* 18: 167. 1969.

ERIOCAULON ANGUSTISEPALUM H. Hess

Additional & emended bibliography: H. Hess, *Bericht. Schweiz. Bot. Gesell.* 65: 160, fig. 7 & 8, & 169—174, pl. 9, fig. 2, 6, & 7. 1955; Moldenke, *Phytologia* 17: 479—480 (1969) and 18: 86, 110, & 321. 1969.

ERIOCAULON ANNAMENSE H. Lecomte

Additional bibliography: H. Lecomte, Fl. Gén. Indo-Chine 7: 2 & 5--6. 1912; Moldenke, Phytologia 18: 167. 1969.

ERIOCAULON ANNUM Milne-Redhead

Additional bibliography: Moldenke, Phytologia 17: 480. 1969.

Robinson describes this plant as an erect annual, growing in the "dambo" at an altitude of 1350 meters.

Additional citations: ZAMBIA: E. A. Robinson 3506 (Mu).

ERIOCAULON ANTUNESII Engl. & Ruhl.

Additional bibliography: Moldenke, Phytologia 18: 77. 1969.

Mr. R. D. Meikle has examined the Malaisse 4489 & 6005 collections which I sent to the Royal Botanic Gardens at Kew for determination. According to a letter from E. Milne-Redhead, dated June 12, 1969, "he is of the opinion that the two *Eriocaulons* are conspecific, and that both are *Eriocaulon antunesii* Engl. & Ruhl. Unfortunately we do not have the type of this species at Kew, and cannot be quite certain of the identification, though everything in the description agrees with your plants. Mr. Meikle also notes that *Eriocaulon stoloniferum* Welw. ex Rendle is most probably synonymous with *E. antunesii*. Both species were described from Angolan (Huilla) material, and it is evident that the respective authors were unaware of each other's activities at the time when the species were described."

Actually, I have compared these Malaisse collections with an isotype of *E. antunesii* in my personal herbarium and find them to be very different. They are being treated in these Notes under *E. malaissei* and *E. malaissei* f. *viviparum* Moldenke, which see.

Emended citations: VOLTAIC REPUBLIC: Winkony 3 (Ac).

ERIOCAULON AQUATILE Körn.

Additional bibliography: C. Müll. in Walp., Ann. 5: 931 (1860) and 6: 1170. 1861; Moldenke, Phytologia 17: 480. 1969.

The type of this species was collected by Carl Friedrich Philipp von Martius at Serra de São Antonio, Minas Gerais, Brazil, in August, 1818, and is deposited at Munich. The species has been collected in anthesis and fruit in June and August.

Additional citations: BRAZIL: Minas Gerais: Martius s.n. [Serra de S. Antonio; Macbride photos 18684] (Mu--180--type). State undetermined: J. E. Pohl s.n. [in Brasilia] (Mu--181).

ERIOCAULON ARECHAVALETAE Herter

Additional bibliography: Moldenke, Phytologia 18: 167--168, 259, 276, & 277. 1969.

ERIOCAULON ARENICOLA Britton & Small

Additional bibliography: Moldenke, Phytologia 17: 480--481. 1969.

Additional citations: ISLA DE PINOS: Carabia 1152 (Cr.)

ERIOCAULON ARISTATUM H. Hess

Synonymy: Eriocaulon welwitschii var. pygmaeum Rendle, Cat. Afr. Pl. Welw. 2: 97. 1899. Eriocaulon welwitschii pygmaeum Rendle apud Stapf, Ind. Lond. 3: 91. 1930.

Additional bibliography: Rendle, Cat. Afr. Pl. Welw. 2: 97—98. 1899; Ruhl. in Engl., Pflanzenreich 13 (4-30): 99. 1903; Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Phytologia 17: 481 (1969) and 18: 98. 1969.

Additional illustrations: Ruhl. in Engl., Pflanzenreich 13 (4-30): 99, fig. 13 D. 1903.

The type of E. welwitschii var. pygmaeum was collected by Friedrich Martin Josef Welwitsch (no. 2444) in damp sandy fields which in the previous year had been planted with Sorghum and Penicillaria, near Lopollo, Huila, Angola, in April or May, 1860. In some previous publications I regarded this variety as identical with typical E. welwitschii Rendle, from which it was said by Rendle (1899) to differ only in being "A dwarf congested form with almost glabrous receptacle." He also described it as having "Flower-heads subfuscous within, whitish outside", and the plant itself "widely caespitose". Friedrich-Holzhammer (1967) cites Dinter 7220 and Volk 1806 from Southwest Africa.

Additional citations: ANGOLA: Huila: Welwitsch 2444 (Mu, N). SOUTHWEST AFRICA: Dinter 7220 [Grosfontein, 25.4.1934] (Mu), 7220 [Vley bei Naruchas, Mitte Mai 1934] (Mu, Z); Volk 1806 (Mu, Mu).

ERIOCAULON ATRATUM Körn.

Additional bibliography: C. Müll. in Walp., Ann. 5: 926 & 932—933 (1860) and 6: 1170. 1861; Moldenke, Phytologia 18: 168, 172, & 445. 1969.

ERIOCAULON ATRATUM var. MAJOR Thwaites

Additional & emended synonymy: Eriocaulon philippo-coburgi Szyszyl. ex Wawra, Itin. Princ. S. Coburg. 2: 96, pl. 12. 1888. Eriocaulon robustum var. caulescens (Hook. f. & Thoms.) Fyson, Journ. Indian Bot. 3: 310, pl. 30. 1921. Eriocaulon philippo-coburgii Szyszyl. apud Stapf, Ind. Lond. 3: 91. 1930.

Additional & emended bibliography: Wawra, Itin. Princ. S. Coburg. 2: 96, pl. 12. 1888; Fyson, Journ. Indian Bot. 2: 310 & 312, pl. 30. 1921; Stapf, Ind. Lond. 3: 90 & 91. 1930; Moldenke, Phytologia 18: 168 & 445. 1969.

Illustrations: Wawra, Itin. Princ. S. Coburg. 2: pl. 12. 1888; Fyson, Journ. Indian Bot. 2: pl. 30. 1921.

Fyson (1921) under E. robustum says: "Var. b. caulescens. Hook. f. and Thoms. F. B. I. vi, 572, No. 5; Ruhl. as E. atratum var. major No. 74. Stem 3—10 in. branched, the lower parts covered with leaf-bases. Leaves narrowed above the broad base, and then 1/4 in. wide or less by 3—6 in. Scapes 6—25 in. Involucre black. Plate 30. Ceylon: Horton Plain. Adam's

Peak. There is no real difference except in the stem and its branching from E. robustum. A piece of the Ceylon plant is indistinguishable from a not very robust Nilgiri one. I have therefore no hesitation in uniting this as a variety to E. robustum, though Hooker founded a new species for it, and Ruhland followed Thwaites in calling it var. major of E. atratum. The fresh flower heads have the scent of a Chrysanthemum."

ERIOCAULON ATROIDES Satake

Additional bibliography: Satake in Nakai, Icon. Pl. As. Orient. 2: 173--176 & 192, pl. 65. 1938; Moldenke, Phytologia 18: 78. 1969.

Additional citations: WESTERN PACIFIC ISLANDS: JAPAN: Honshu: Furuse s.n. [5 Oct. 1955] (Ac).

ERIOCAULON ATRUM Nakai

Additional & emended bibliography: Satake in Nakai, Icon. Pl. As. Orient. 2: 175. 1938; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] 49, 52, 53, 57, & 60--61, pl. 12, fig. 24. 1940; Koyama, Journ. Jap. Bot. 31: 6. 1956; Moldenke, Phytologia 18: 168, 181, 255, 312, 323, 441, & 449. 1969; Tatew. & Ishizuka, Sapp. Bull. Bot. Gard. Hokk. Univ. 2: 21, 22, & 30. 1969.

Tatewaki & Ishizuka (1969) report this species as growing in the Eriophorum gracile association, in the Phragmites communis and Carex limosa association, and with Carex middendorffii in Japan.

The Furuse 19850, distributed as E. atrum, is actually E. robustius (Maxim.) Mak.

ERIOCAULON AUSTRALASICUM (F. Muell.) Körn.

Emended synonymy: Eriocaulon australasicum Körn. ex C. Müll. in Walp., Ann. 5: 931. 1860.

Additional bibliography: C. Müll. in Walp., Ann. 5: 926 & 934 (1860) and 6: 1170. 1861; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 25. 1888; Moldenke, Phytologia 18: 168. 1969.

The initial letter of the specific epithet of this taxon is uppercased by Müller (1861).

ERIOCAULON AUSTRALE R. Br.

Additional bibliography: Spreng. in L., Syst. Veg., ed. 16, 3: 776. 1826; C. Müll. in Walp., Ann. 5: 927 & 946 (1860) and 6: 1170. 1861; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 25. 1888; C. H. Wright, Journ. Linn. Soc. Lond. Bot. 36: 198. 1903; H. Lecoute, Journ. de Bot. 21: 89, 91, & 94. 1908; H. Lecoute, Fl. Gén. Indo-Chine 7: 2 & 8. 1912; Van Royen, Nova Guinea, new ser., 10: 236. 1960; Moldenke, Phytologia 18: 168. 1969.

This species seems to be extremely close to, if not conspecific with, E. willdenovianum Moldenke. Van Royen (1960) cites Van

Royen 4871 & 4872 from New Guinea.

Additional citations: AUSTRALIAN REGION: AUSTRALIA: Queensland: Meebold 8021 (Mu).

ERIOCAULON BATAVORUM Van Royen

Bibliography: Van Royen, Blumea 10: 128. 1960.

Nothing is known to me about this taxon as I have not been able to ascertain where, if ever, it has been described. The editors of the "Index Kewensis" inform me that it is not in the manuscript for the next supplement of this work.

ERIOCAULON BEAUVERDI Moldenke

Additional synonymy: Eriocaulon helichrysoides giganteum Beauverd apud Stapf, Ind. Lond. 3: 90. 1930.

Additional & emended bibliography: Beauverd, Bull. Herb. Boiss., sér. 2, 8: 283 & 285, fig. 9A (1908) and 8: 987--988, fig. 1 H & J. 1909; Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 17: 482--483. 1969.

Additional illustrations: Beauverd, Bull. Herb. Boiss., sér. 2, 8: 987, fig. 1 H & J. 1909.

This species has been collected in anthesis and fruit in July and August.

Additional citations: BRAZIL: São Paulo: F. C. Hoehne 367 [Butantan, 27/7/17] (Mu), 367 [Butantan, 27/8/17] (Mu).

ERIOCAULON BENTHAMII Kunth

Additional bibliography: C. Müll. in Walp., Ann. 5: 930 (1860) and 6: 1170. 1861; Moldenke, Phytologia 18: 169, 188, 249, & 264. 1969.

McGregor found this plant in flower and fruit in April. The Pringle 1734, distributed as E. benthamii, is actually the type collection of E. guadalajarensis Ruhl.

Additional citations: MEXICO: Jalisco: R. L. McGregor 16617 (N); R. McVaugh 20473 (N), 23493 (Mi). México: Hinton 4549 (Se-107926). Michoacán: R. McVaugh 22500 (Mi).

ERIOCAULON BIFISTULOSUM Van Heurck & Muell.-Arg.

Additional & emended bibliography: F. M. Bailey, Compreh. Cat. Queensl. Fl. 584. 1913; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 127, fig. 3, & 130--132, pl. 7, fig. 1--5. 1955; Berhaut, Fl. Sénégal, ed. 2, 312. 1967; Moldenke, Phytologia 18: 169, 173, 181, 243, 244, 280, 429, & 433. 1969.

Illustrations: H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 127, fig. 3, & pl. 7, fig. 3--5. 1955.

This species has been collected in shallow more or less stagnant water, flowering and fruiting in June. The Dehn 901, cited below, is accompanied by a colored drawing on the same sheet.

The type of the species was collected by Charles Barter (no. 1021) at Nupe in Northern Nigeria, a collection which is also the type of E. limosum Engl. & Ruhl. [not E. limosum Sieb. & Zucc.,

which is E. alpestre Hook. f. & Thoms.]. Berhaut 6502, from Sénégal, is cited by Berhaut (1967) as E. setaceum L., but will probably prove to be E. bifistulosum instead. Hooker (1893) believed that E. bifistulosum occurs also in Australia, but Bailey (1913) regards the Australian material as E. setaceum, which seems more probable to me.

Additional & emended citations: SÉNÉGAL: J. G. Adam 17442 (Rf); Couey 1 (Ac). NIGERIA: Northern: C. Barter 1021 (Mu--299--isotype). ZAMBIA: E. A. Robinson 3759 (Mu). RHODESIA: Dehn 769 (Mu), 901 (Mu).

ERIOCAULON BILOBATUM Moreng

Additional bibliography: Moldenke, Phytologia 18: 169. 1969.

Additional citations: MEXICO: Jalisco: Pringle 3855 (Mu--370--isotype), 6299 (Mu--352).

ERIOCAULON BIPETALUM Good

Bibliography: R. Good, Geogr. Flow. Pl. 227 & 483. 1964.

I know nothing about this taxon except that it is mentioned by Good (1964) without authority and as a nomen nudum, "said to occur in the Madagascar region as well as on the two continents" of America and Africa. The only eriocaulaceous plant to which this comment could apply is Paepalanthus lamarckii Kunth.

ERIOCAULON BLUMEI Körn.

Additional bibliography: Moldenke, Phytologia 18: 169 & 275. 1969; Moldenke, Biol. Abstr. 50: 2584. 1969.

ERIOCAULON BONGENSE Engl. & Ruhl.

Additional bibliography: Moldenke, Phytologia 18: 79. 1969.

This species has been collected on damp ground, flowering and fruiting in July.

Additional & emended citations: SÉNÉGAL: Wikony 2 (Rf). ZAMBIA: E. A. Robinson 5552 (Mu).

ERIOCAULON BONI H. Lecomte

Additional & emended bibliography: H. Lecomte, Journ. de Bot. 21: 89, 94, & 108. 1908; H. Lecomte, Fl. Gén. Indo-Chine 7: 2 & 13. 1912; Moldenke, Phytologia 17: 484. 1969.

ERIOCAULON BRACHYPEPLON Körn.

Additional bibliography: C. Müll. in Walp., Ann. 5: 926 & 943 (1860) and 6: 1170. 1861; Moldenke, Phytologia 17: 484. 1969.

ERIOCAULON BREVIPELUNCULATUM Merr.

Additional bibliography: Heine in Fedde, Repert. Spec. Nov. 54: 224. 1951; Van Royen, Blumea 10: 133 & 134. 1960; Moldenke, Phytologia 18: 169--170 & 262. 1969.

Brass found this plant growing "in close-packed mosses at edge of lake and on marshy slopes" and "common in close masses

on alpine seepage slopes", flowering and fruiting from May to July. The E. brevipedunculatum Suesseng. & Heine is a synonym of E. kinabaluense Van Royen. According to the studies of Van Royen (1960) the Indonesian specimens previously regarded by Merrill and by me as representing Merrill's E. brevipedunculatum actually deserve segregation as separate taxa. The Eyma 863 collection is now the type collection of E. celebicum Van Royen, while M. S. Clemens 10543 & 10611 and Clemens & Clemens 32336 & 51120 are E. kinabaluense Van Royen.

Additional citations: MELANESIA: NEW GUINEA: Papua: Brass 4365 (W—1943053), 4367 (W—1943054).

ERIOCAULON BREVIPEDUNCULATUM var. ANGUSTIFOLIUM Moldenke

This taxon has now been reduced to synonymy under E. tubiflorum Van Royen, which see.

ERIOCAULON BREVISCAPUM Körn.

Additional & emended bibliography: Körn., Linnaea 27: 676—677. 1856; C. Müll. in Walp., Ann. 5: 926 & 944 (1860) and 6: 1170. 1861; Moldenke, Phytologia 18: 170. 1969.

According to Körnicke's original description, this species is based on a collection made by Carl Alexander Anselm Hügel (no. 3862), probably in Bombay, India, and deposited in the Vienna and Zuccarini herbaria. The Hügel specimen cited below is probably an isotype, but is not numbered.

Additional citations: INDIA: State undetermined: Hügel s.n. [Ind. or.] (Mu—182).

ERIOCAULON BROMELIOIDEUM H. Lecomte

Additional bibliography: H. Lecomte, Fl. Gén. Indo-Chine 7: 3 & 17. 1912; Moldenke, Phytologia 18: 170. 1969.

ERIOCAULON BROMELIOIDEUM var. LATIFOLIUM H. Lecomte

Additional bibliography: H. Lecomte, Fl. Gén. Indo-Chine 7: 17. 1912; Moldenke, Phytologia 18: 170. 1969.

Lecomte (1912) describes this plant as having "Feuilles beaucoup plus longues, atteignant 8—10 cm."

ERIOCAULON BROWNIANUM Mart.

Additional synonymy: Eriocaulon bronianum Wall. ex Fyson, Fl. Nilg. & Puln. Hill-tops 1: 430, sphalm. 1915.

Additional bibliography: Mart. in Wall., Pl. Asiat. Rar. 3: 25—26 & 28, pl. 248. 1832; C. Müll. in Walp., Ann. 5: 926 & 943 (1860) and 6: 1170. 1861; H. Lecomte, Journ. de Bot. 21: 89 & 91. 1908; H. Lecomte, Fl. Gén. Indo-Chine 7: 2 & 11. 1912; Fyson, Fl. Nilg. & Puln. Hill-tops 1: 429 & 430. 1915; Stapf, Ind. Lond. 3: 90. 1930; C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. repr. 2, 8 [3]: 1122, 1127, & 1333. 1956; Backer & Bakh., Fl. Java 3: 25. 1968; Moldenke, Phytologia 18: 170—171, 275, 351—353, & 443. 1969.

Emended illustrations: Mart. in Wall., Pl. Asiat. Rar. 3: pl. 248 [in color]. 1832.

Backer & Bakhuizen van den Brink (1968) describe this species as follows: "Interfloral bracts in their upper halves or on their tops with numerous short white hairs; involucre bracts, especially in young heads, dorsally rather densely pubescent; peduncles 15--100 cm, densely pubescent especially at apex; heads depressed-globose, 10--15 mm across; interfloral bracts with a triangular, rather acute top; sepals 3, apically dark-coloured and densely white-pubescent; petals 3, villous, with a distinct, subapical gland; anthers 6, dark-coloured; style-arms 3. Leaves linear, rather acute, 10--80 cm by 6--20 mm, rather thick, on both surfaces clothed with rather short, white hairs. 0.15--1.00; I--XII; W. C., very local; 1600--2000; swamps; locally often very numerous. Conspicuous plant (*E. blumei* Koern.)."

Fischer (1956) cites an "*Eriocaulon brownianum* Mart., in part" as a synonym of *E. nilagirens* Steud. The *Hosseus* 41, distributed as *E. brownianum*, is actually *E. nilagirens*, while Meebold 9730 is *E. robusto-brownianum* Ruhl.

Additional citations: PAKISTAN: East Bengal: De Silva & Gomez s.n. [Wallich 6066] (Mu--183--isotype, Mu--322--isotype); W. Griffith 5574 (Mu--203). INDIA: Khasi States: Hooker & Thomson s.n. [Mont. Khasia, 3--5000 ped.] (Mu--184). Madhya Pradesh: Lal & party 33277 (Mu).

ERIOCAULON BRUNONIS Britten

Additional & emended bibliography: Benth. & F. Muell., Fl. Austral. 7: 193, 197, & 792. 1878; Moldenke, Phytologia 18: 171, 270, & 451. 1969.

ERIOCAULON BUCHANANII Ruhl.

Additional bibliography: Moldenke, Phytologia 18: 171, 245, & 393. 1969.

Recent collectors have found this plant growing in damp ground, bogs, and in the habitats called "vley" and "dambo", flowering and fruiting in July.

Additional citations: REPUBLIC OF GUINEA: Schnell 2154 (An, F--photo, Sg--photo, Z--photo). ZAMBIA: E. A. Robinson 3714 (Mu), 5541 (Mu), 5553 (Mu). SOUTHWEST AFRICA: Volk 2127 (Mu).

ERIOCAULON BUERGERIANUM Körn.

Additional synonymy: *Cephalaria ensifolia* Bürger, in herb.

Additional bibliography: Iinuma, Somoku Dzusetsu, ed. 2, 17: pl. 50. 1874; H. Lecomte, Journ. de Bot. 21: 89 & 92. 1908; Hayata, Icon. Pl. Formos. 10: 52 & 272, fig. 29. 1921; Sasaki, Cat. Govt. Herb. 118. 1930; Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 3: 337 (1950) and 18: 171, 354, & 440. 1969.

Additional illustrations: Iinuma, Somoku Dzusetsu, ed. 2, pl. 50. 1874.

According to Körnicke (1867) this species is based on a speci-

men collected "Prope Iwajagama m. Oct." and of it he also says "legerunt Siebold et Buerger". The cheironymous name, Cephalaria ensifolia, appears to be based on the Bürger s.n., from Japan, cited below, deposited in the Munich herbarium. It is possible that this specimen may be part of the type collection of Eriocaulon buergerianum.

Tsang reports this plant as "abundant in swamp, sandy soil, rice terrace", at an altitude of 1 meter above sea level. Other recent collectors report it as an erect herb "rare in rice terraces and retaining walls", describe the heads as "white", and have found the plant in flower in September, October, and December. Material has been misidentified and distributed in herbaria as E. cristatum Mart. On the other hand, the Suzuki s.n., distributed as E. buergerianum, is actually E. sexangulare L.

Additional citations: CHINA: Kwangtung: W. T. Tsang 20687 (W—1753776). Szechuan: C. L. Chow 4676 (W—1990439), 4678 (W—1990441); T. C. Lee 3521 (W—1990131). Yünnan: Maire 3928 (W—775746). WESTERN PACIFIC ISLANDS: JAPAN: Island undetermined: Bürger s.n. [in Japonia] (Mu—185).

ERIOCAULON CAPITULATUM Moldenke

Additional & emended bibliography: Moldenke, *Phytologia* 2: 132—134 (1948) and 17: 487. 1969.

The foliage of this plant is almost identical to that of E. paradoxum Moldenke.

ERIOCAULON CARSONI F. Muell.

Additional bibliography: Van Royen, *Blumea* 10: 128. 1960; Moldenke, *Phytologia* 18: 172. 1969.

This species has been collected in flower and fruit in October.

Citations: AUSTRALIAN REGION: AUSTRALIA: South Australia: M. Koch 467 (Mu—357, 2).

ERIOCAULON CAULIFERUM Mak.

Additional & emended bibliography: Mak., *Bot. Mag. Tokyo* 24: 165 & 166. 1910; Stapf, *Ind. Lond.* 3: 90. 1930; Moldenke, *Phytologia* 18: 81. 1969.

Additional illustrations: Mak., *Bot. Mag. Tokyo* 24: 166. 1910.

ERIOCAULON CELEBICUM Van Royen

Additional & emended bibliography: Van Royen, *Blumea* 10: 127—129, fig. 1B. 1960; D. N. F. Kiehl, *Blumea* 10: 657. 1960; Moldenke, *Phytologia* 17: 453 (1968) and 18: 81. 1969.

Illustrations: Van Royen, *Blumea* 10: 129, fig. 1B. 1960.

The type of this species was collected by Pierre Joseph Eyma (no. 863) on Celebes and was previously erroneously cited by me as E. brevipedunculatum Merr.

Citations: INDONESIA: GREATER SUNDA ISLANDS: Celebes: Eyma 863 (Ut—11517b—isotype).

ERIOCAULON CEYLANICUM Körn.

Additional bibliography: C. Müll. in Walp., Ann. 5: 926 & 943 (1860) and 6: 1170. 1861; H. Lecomte, Journ. de Bot. 21: 91. 1908; Moldenke, Phytologia 18: 168, 172, & 270. 1969.

The initial letter of the specific epithet of this taxon is uppercased by Müller (1861). The Hosseus specimen cited below bears a printed label inscribed "Reise nach Siam", but the handwritten locality name and number indicate that the collection was actually made in Ceylon, not in Thailand.

Additional citations: CEYLON: Hosseus 40 (Mu—401).

ERIOCAULON CHINOROSSICUM Komarov

Additional bibliography: Steinberg in Komarov & Schischkin, Fl. U. S. S. R. 3: 497—498, pl. 27, fig. 2 a—c (1935) and Engl. transl., 3: 394. 1964; Moldenke, Phytologia 18: 81. 1969.

Illustrations: Steinberg in Komarov & Schischkin, Fl. U. S. S. R. 3: pl. 27, fig. 2 a—c. 1935.

It is of interest to note that the English translation of the Fl. U. S. S. R. (1964) gives the title of the work in which this taxon was originally described and published as "Bull. Jard. Bot. Pierre Le Grand", while the Index Kewensis uses its original title as "Bull. Jard. Bot. Pétersb." The species was described from the coast of Vostok Bay, the type being HFR 2373, deposited in the herbarium at Leningrad.

ERIOCAULON CHRISTOPHERI Fyson

Additional bibliography: Fyson, Fl. Nilg. & Puln. Hill-tops 1: 428 & 431 (1915) and 2: pl. 275. 1915; Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 17: 487—488 (1969) and 18: 361. 1969.

Illustrations: Fyson, Fl. Nilg. & Puln. Hill-tops 2: pl. 275. 1915.

Fyson (1915) describes this plant as follows: "I 45. Stems tufted: scapes several 4 to 7 inches, stout: sheaths 1 inch, with bifid mouth. Leaves 1 to 1 1/4 inches, firm about nine-nerved, thick and channelled above. Heads 1/8 to 1/6 inch. Lowest bracts brown, glabrous; inner black, acuminate. Receptacle villous. Floral bracts fringed with thick white hairs. Male flowers:— Sepals united into a spathe split in front, fringed with thick white hairs. Corolla tube slender; lobes unequal very long, with small glands, and fringed with long white hairs. Anthers black. Female flowers:— Sepal black, boat-shaped, with scattered hairs along the margin and keel. Petals white, oblan-ceolate, with long hairs and small glands. t. 275. In damp ground. Nilgiri: at Pykara, flowering May. Fyson 2718. Perhaps Schmidt left hand plant on sheet marked E. trilobum from Kaity, etc., in cover of E. collinum at Kew. Not known elsewhere. The male petals are unusually long and the hair fringing them and on the female petal are also long."

ERIOCAULON CILIIPETALUM H. Hess

Additional bibliography: Moldenke, *Phytologia* 17: 488 (1969) and 18: 449. 1969.

ERIOCAULON CINEREUM R. Br.

Additional & emended synonymy: Eriocaulon quinquangulare var. ♂ C. Müll. in Walp., *Ann.* 5: 940. 1860. Eriocaulon sieboldianum Steud. ex Mak., *Bot. Mag. Tokyo* 8: 506, in syn. 1894. Eriocaulon stühlmannii N. E. Br. apud H. Lecomte, *Fl. Gén. Indo-Chine* 7: 14, in syn. 1912. Eriocaulon sexangulare (L.) Auct., in herb. Eriocaulon 5-angulare König, in herb. [not E. 5-angulare L., 1959]. Eriocaulon 5-angulare var. pusillum Körn., in herb. Eriocaulon 5-angulare var. erythropodium Miq., in herb.

Additional & emended bibliography: Hook. & Arn., *Bot. Beech. Voy.* 219. 1841; C. Müll. in Walp., *Ann.* 5: 926, 933—935, & 940 (1860) and 6: 1170 & 1171. 1861; Collett, *Fl. Siml.* 550. 1902; Ruhl. in Engl., *Pflanzenreich* 13 (4-30): 11, 13, 21, 22, 104, 111—114, 116, 117, & 285, fig. 15 A—G. 1903; H. Lecomte, *Journ. de Bot.* 21: 88, 89, & 93. 1908; Mak., *Somoku Dzusetsu* [Iconogr. *Pl. Nipp.*] 17: pl. 48. 1912; H. Lecomte, *Fl. Gén. Indo-Chine* 7: 2 & 13—14. 1912; Fedsh., *Rastit. Turk.* 811. 1915; Hayata, *Icon. Pl. Formos.* 10: 49 & 272, fig. 27. 1921; Sasaki, *Cat. Govt. Herb.* 118 & 119. 1930; Stapf, *Ind. Lond.* 3: 91. 1930; K. Larsen, *Dansk Bot. Ark.* 23: 378. 1966; Backer & Bakh., *Fl. Java* 3: 25—26. 1968; Moldenke, *Phytologia* 18: 169, 172—173, 180, 243, 244, 249, 274, 299—300, 303, 309, 350, 362, 372, 429, 433, 438, 439, & 441. 1969.

Additional & emended illustrations: Collett, *Fl. Siml.* 550. 1902; Ruhl. in Engl., *Pflanzenreich* 13 (4-30): 112, fig. 15 A—G. 1903; Mak., *Somoku Dzusetsu* [Iconogr. *Pl. Nipp.*] 17: pl. 48. 1912.

Backer & Bakhuizen van den Brink (1968) give a partial description of this taxon: "Large leaves less than 2 mm wide in their middle part, 1.5—8 cm long, rather acute. Heads ovoid-globose, 3—4 mm across; involucre bracts oblong, rather obtuse; inter-floral bracts narrowly oblong, rather acute; ♂: sepals more or less connate into a unilaterally cleft sheath, pale, with a darker coloured upper half, glabrous; petals very minute; ♀: sepals 2—3, linear-filiform; petals none." They note that the species has been found in flower in Java from January to July, but probably blooms all year, in "swampy localities, especially flooded rice-fields". Hohenacker notes that the plant blooms in the rainy season in India.

The Herb. Schreber specimen, cited below, bears a handwritten memorandum by Schultes, dated August 24, 1862, stating that this specimen cannot be E. sexangulare L., that the E. sexangulare Auct. is probably E. minimum Lam., in part, and that E. sexangulare L. is probably E. wallichianum Mart.

The Hooker & Thomson s.n. [Silhet, Alt. O] and T. Thomson s.n. [Plan. Ganget. Sup.], also cited below, are both mixtures with E.

truncatum Hamilt. The Loher 12947 specimen has a label which was originally inscribed "14820", but this number was later stricken out by someone and "12947" was substituted.

Material of E. cinereum has been misidentified and distributed in herbaria under the names E. hexangulare L., E. quinquangulare L., and E. setaceum L. On the other hand, the Chang & En 2926 and Cheng 3042, distributed as E. cinereum, are actually E. truncatum Hamilt.

Additional citations: CALIFORNIA: Stanislaus Co.: Markos s.n. [Modesto, 9-18-47] (Se—188680). PAKISTAN: East Bengal: W. Griffith 5565 (Mu—307), 5579 (Mu—300); Herb. Schreber s.n. [Selampur, Bengal] (Mu—241); Herb. Zuccarini s.n. [Bengal] (Mu—246); Hooker & Thomson s.n. [Chittagong, 0—1000 ped.] (Mu—249), s.n. [Silhet, alt. 0] (Mu—247); Wallich 6073a (Mu—244). NEPAL: Poelt s.n. [27.10.1962] (Mu). INDIA: Kerala: Hohenacker 131b (Mu—252), 131bb (Mu—251). Madras: König s.n. [Tranguebar] (Mu—242, Mu—243). Mysore: G. Thomson s.n. [Maison & Carnatic] (Mu—254). State undetermined: Collector undesignated s.n. [Madhya, 17.5.56] (Mu); Hügel s.n. [India orientalis] (Mu—245); T. Thomson s.n. [Plan. Ganget. Sup.] (Mu—248). WESTERN PACIFIC ISLANDS: JAPAN: Honshu: C. Hashimoto 1624 (Se—199280); Itô & Koyama 826 (Se—159515); Maximowicz s.n. [Yokohama, 1862] (Mu—348). Island undetermined: Burger s.n. [In Japonia] (Mu—255). PHILIPPINE ISLANDS: Luzon: Loher 1605 (Mu—377), 12947 (Mu—416); E. D. Merrill 293 (Mu—400). INDONESIA: GREATER SUNDA ISLANDS: Java: Kollmann s.n. [Java] (Mu—250); Reinwardt s.n. [Java] (Mu—250).

ERIOCAULON CIPOENSE Alv. Silv.

Additional bibliography: Alv. Silv., Fl. Serr. Min. pl. 10. 1908; Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 18: 173. 1969.

Additional illustrations: Alv. Silv., Fl. Serr. Min. pl. 10. 1908.

ERIOCAULON COERULEUM Van Royen

Additional & emended bibliography: Van Royen, Blumea 10: 128—130, fig. 1C. 1960; D. N. F. Kiehl, Blumea 10: 657. 1960; Moldenke, Phytologia 18: 82. 1969.

Illustrations: Van Royen, Blumea 10: 129, fig. 1C. 1960.

The type of this species was collected by Cornelis Gijsberg Gerrit Jan van Steenis (no. 10320) on the island of Celebes. The species is apparently known only from the type collection.

ERIOCAULON COLLETTII Hook. f.

Additional & emended bibliography: H. Lecomte, Journ. de Bot. 21: 89 & 92. 1908; Fyson, Journ. Indian Bot. 2: 196—197 & 261, pl. 3. 1921; Moldenke, Phytologia 18: 173. 1969.

Kingdon-Ward found this plant growing at 6000 feet altitude,

flowering in September.

Additional citations: INDIA: Manipur: Kingdon-Ward 18096 (N).

ERIOCAULON COLLINUM Hook. f.

Additional synonymy: Eriocaulon collinum H. R. F., in herb.

Additional bibliography: Fyson, Fl. Nilg. & Puln. Hill-tops 1: 428, 430, & 431 (1915) and 2: pl. 274. 1915; Stapf, Ind. Lond. 3: 90. 1930; C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. repr. 2, 8 [3]: 1125, 1128, & 1333. 1956; Moldenke, Phytologia 18: 173, 264, 272--274, & 361. 1969.

Illustrations: Fyson, Fl. Nilg. & Puln. Hill-tops 2: pl. 274. 1915.

Mooney found this plant growing in swampy grassland by the side of a large stream at 3100 feet altitude, flowering and fruiting in October.

Fyson (1915) describes E. collinum as follows: "Thwaites enum. 44. C. P. 10001; F. B. I. vi 584, I 41; common small Grey-head. Stems tufted. Leaves 1 1/2 to 2 1/2 by 1/8 inch, flat weak, obtuse. Scapes many, 3 to 8 inches, twisted when dry: sheaths 1 1/4 inches; mouth oblique, not very acute. Involucral bracts all black, or the lowest and outermost in bud brown. Floral bracts numerous. Male flowers very small, 1.5 mm: -- Sepals 1.2 mm, united into a spathe easily split into parts of different width, fringed with short white hairs. Corolla tube funnel-shaped, very slender below; lobes unequal, one petal longer and narrower, fringed with long thick hairs. Female flowers: -- Sepals boat-shaped, with white hairs above most of the back and keel. Petals long, lanceolate, fringed with thick hairs to the base but not hairy. Receptacle villous. t. 274. In damp places, common. Nilgiris: on the plateau, Pykara, Kotagiri, etc. Fyson 5461, 1086, 2084, 2695, 2720, 2920, 2993, 2995. Bourne prob. 3129. Gen. Dist. South India and Ceylon at Newera Elia. The female petals and the long white hairs of the male are visible on the surface of the flower-head."

Additional citations: INDIA: Orissa: H. F. Mooney 4148 (N). CEYLON: Hosseus 39 (Mu--398).

ERIOCAULON COMPRESSUM Lam.

Emended synonymy: Eriocaulon decangulare Walt., Fl. Carol. 83. 1788 [not E. decangulare Hill, 1799, nor Hope, 1770, nor Huds., 1959, nor Hull, 1841, nor L., 1753, nor Lightf., 1777, nor Michx., 1959, nor Willd., 1841].

Additional & emended bibliography: C. Müll. in Walp., Ann. 5: 925 & 928--929. 1860; A. W. Chapm., Fl. South. U. S., ed. 1, pr. 1, 503 (1860), ed. 1, pr. 2, 503 (1865), ed. 1, pr. 3, 503 (1872), ed. 2, pr. 1, 503 (1883), ed. 2, pr. 2, 503 (1884), ed. 2, pr. 3, 503 (1887), ed. 2, pr. 4, 503 (1889), ed. 2, pr. 5, 503 (1892), and ed. 3, 530. 1897; W. Stone, Ann. Rep. N. J. State Mus. 1910: [Pl. South. N. J.] 323--325, pl. 64, fig. 2. 1912; Stapf, Ind. Lond. 3: 90. 1930; Cave, Madrofia 19: 134. 1967; W. C. Grimm, Recog. Flow. Wild Pl. 36. 1968; Ornduff, Reg. Veg. 59: 32 & 116.

1969; Rogerson, Rickett, & Becker, Bull. Torr. Bot. Club 96: 387. 1969; Moldenke, Phytologia 18: 173—174, 267, 268, 300—301, & 379—381. 1969.

Emended illustrations: Britton & Br., Ill. Fl., ed. 1, 1: 372, fig. 900. 1896; W. Stone, Ann. Rep. N. J. State Mus. 1910: [Pl. South. N. J.] pl. 64, fig. 2. 1912; Britton & Br., Ill. Fl., ed. 2, 1: 454, fig. 1142. 1913.

Cave (1967) reports the chromosome number for this species as $n = 20$, based on I. L. Wiggins 19220 from Levy County, Florida.

The Collector undesignated 210, Curtiss s.n. [Jacksonville, April 1877], and Meebold 28097, distributed as E. compressum, are actually E. decangulare L., while A. Ruth s.n. [March 1893] is Syngonanthus flavidulus (Michx.) Ruhl.

Additional citations: NEW JERSEY: Ocean Co.: A. B. Rich s.n. [Tom's River, May 30, '87] (N). DELAWARE: Sussex Co.: G. R. Proctor 1868 (Se—113482). NORTH CAROLINA: Brunswick Co.: C. R. Bell 11552 (N); A. E. Radford 43810 (Se—213412). Onslow Co.: Radford & Stewart 1213 (N). SOUTH CAROLINA: Darlington Co.: W. C. Coker s.n. [June 27, 1931] (N). GEORGIA: Wayne Co.: A. Ruth s.n. [Jesup, June 1893] (Se—196011). FLORIDA: Duval Co.: Curtiss 3017 (Mu—365).

ERIOCAULON COMPTONII Rendle

Additional & emended bibliography: Rendle, Journ. Linn. Soc. Lond. Bot. 45: 259—260. 1921; Guillaumin, Fl. Analyt. & Synopt. Nouv.-Caléd. 49—50. 1948; Moldenke, Phytologia 17: 493 (1969) and 18: 270, 326, 327, & 367. 1969.

Rendle (1921) notes for this plant "Near E. neocaledonica Schlechter, but apparently a larger plant with smaller heads, and differing in the form of the floral bracts and sepals. The leaves and peduncles are covered with diatoms and the threads of a Cladophora, giving the appearance of hairiness." The type of the species is Compton 368, collected on the "Plaine des Lacs, submerged in streams and marshes, serpentine, 800 ft., Feb."

Guillaumin (1948) keys this species from the other species of New Caledonia known to him as follows:

1. Plants robust; leaves 20—35 cm. long; heads globose; scape 6-ribbed, 20—30 cm. long.....E. pancheri H. Lecomte.
- 1a. Plants very dwarf; leaves 13 cm. or longer.
 2. Heads globose.
 3. Scares plainly ribbed.
 4. Scares 6-ribbed, 14—16 cm. long; leaves 5—13 cm. long; pistillate sepals obtuse...E. comptonii Rendle.
 - 4a. Scares 5-ribbed, 8—20 cm. long; leaves 3—7 cm. long; pistillate sepals acute.....E. scariosum J. Sm.
 - 3a. Scares almost cylindric, 5—8 cm. long; leaves 3—7 cm. long.....E. neo-caledonicum Schlecht.
- 2a. Heads turbinate, very small; scape 7-ribbed, 80—100 cm. long.....E. longipedunculatum H. Lecomte.

ERIOCAULON CONICUM (Fyson) C. E. C. Fischer

Additional bibliography: C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. repr. 2, 8 [3]: 1125--1127 & 1333. 1956; Moldenke, Phytologia 17: 493--494 (1969) and 18: 106, 360, & 362. 1969.

ERIOCAULON CONIFERUM Herzog

Additional bibliography: Moldenke, Phytologia 17: 494. 1969.

The original description of this species states that of the two cotypes on which it is based, Luetzelburg 455 was collected in Bahia and Luetzelburg 1796 was collected at Rio Preto in Goiás. The printed labels on the Munich specimens bear out this statement in both cases. The statement in Phytologia 17: 494 (1969), therefore, that 455 is from Goiás is incorrect. It occurred because of the unfortunate fact that Macbride's type photograph 18685 is labeled as being a photograph of number 455, whereas it is actually a photograph of number 1796 (as can be verified by careful examination of the portion of the collector's label visible in the photograph). Number 455 consists of plants which are very conspicuously viviparous on virtually all of the inflorescence heads. It was found growing in damp places on a campo and the collector notes "E. Glaziovii Ruhl. affine". Number 1796, on the other hand, was collected under two meters of water (!) in the rainy season; a sketch on the sheet illustrates this remarkable habitat condition.

Additional citations: BRAZIL: Bahia: Luetzelburg 455 (Mu--cotype, Z--cotype). Goiás: Luetzelburg 1796 (Mu--cotype).

ERIOCAULON CRASSISCAPUM Bong.

Additional bibliography: C. Müll. in Walp., Ann. 5: 930 (1860) and 6: 1170. 1861; Stapf, Ind. Lond. 3: 90. 1930; Angely, Fl. Anal. Paran., ed. 1, 199. 1965; Moldenke, Phytologia 18: 174. 1969.

Additional citations: BRAZIL: Minas Gerais: Luschnath 40 [Martius 890] (Mu--330). State undetermined: J. E. Pohl s.n. [in Brasilia] (Mu--188).

ERIOCAULON CRISTATUM Mart.

Synonymy: Eriocaulon quinquangulare Heyne ex Wall., Numer. List 208 ["207"], in syn. 1832 [not E. quinquangulare Bojer, 1964, nor L., 1743, nor Mart., 1854, nor Wall., 1858, nor Wight, 1832, nor Willd., 1959]. Eriocaulon cristatum Heyne ex Moldenke, Résumé 287, in syn. 1959 [not E. cristatum Mart. ex Körn., 1856].

Additional & emended bibliography: Wall., Numer. List 208 ["207"]. 1832; C. Müll. in Walp., Ann. 5: 926 & 932 (1860) and 6: 1170. 1861; C. H. Wright, Journ. Linn. Soc. Lond. Bot. 36: 199. 1903; Moldenke, Phytologia 18: 174, 264, 270, 313, 348, 429, 433, & 439. 1969.

The Wallich 6070, cited by me in a previous installment of these notes, should be cited with the qualifying phrase "in part",

since part of the same collection number is the type collection of E. miserum Körn. It should also be noted that Wallich's entry (1832) is merely "6070. Eriocaulon cristatum Mart. Silhet Hk. WG & Ts."

Additional citations: PAKISTAN: East Bengal: W. Griffith 5568 (Mu--306). NEPAL: Wallich 6070, in part (Mu--189, Mu--323.) INDIA: Khasi States: Hooker & Thomson s.n. [Mont. Khasia, 4--5000 ped.] (Mu--190); Native collectors s.n. (Mu--309).

ERIOCAULON CRISTATUM var. BREVICALYX C. H. Wright

Synonymy: Eriocaulon cristatum Benth. apud C. H. Wright, Journ. Linn. Soc. Lond. Bot. 36: 199, in syn. 1903 [not E. cristatum Heyne, 1959, nor Mart., 1832].

Bibliography: Benth., Fl. Hongk. 382. 1861; C. H. Wright, Journ. Linn. Soc. Lond. Bot. 36: 199. 1903.

The original description of this taxon by Wright (1903) is merely "♀ petala sepalis duplo longiora". He bases the taxon on Forbes 465, Hance 795, and Sampson s.n. [near Aberdeen], all from Hongkong, deposited in the British Museum and Kew herbaria.

ERIOCAULON CUSPIDATUM Dalz.

Additional bibliography: C. Müll. in Walp., Ann. 5: 927 & 946 (1860) and 6: 1170. 1861; Dalz. & Gibs., Bomb. Fl. 280. 1861; C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. repr. 2, 8 [3]: 1120, 1126, & 1333. 1956; Moldenke, Phytologia 18: 174. 1969.

The initial letter of the specific epithet of this taxon is upercased by Dalzell & Gibson (1861).

The Stocks, Law &c. s.n. specimen cited below from the Munich herbarium bears a curious notation "Unacum Sagittaria triandra Roxb.", probably indicating an original mixture of material of both species on the same sheet, later separated.

Additional citations: INDIA: Kerala: Stocks, Law &c. s.n. [Malabar, Concan &c.] (Mu--191, Mu--266).

ERIOCAULON DALZELLII Körn.

Additional bibliography: C. Müll. in Walp., Ann. 5: 925 & 931--932 (1860) and 6: 1170 & 1171. 1861; Dalz. & Gibs., Bomb. Fl. 280 & 316. 1861; Moldenke, Phytologia 18: 174, 258, 259, & 360. 1969.

The initial letter of the specific epithet of this taxon is upercased by Dalzell & Gibson (1861).

Additional citations: INDIA: Kerala: Stocks, Law &c. s.n. [Malabar, Concan &c.] (Mu--192).

ERIOCAULON DAMAZIANUM Beauverd

Synonymy: Eriocaulon damazianum P. Beauv. apud Stapf, Ind. Lond. 3: 90, sphalm. 1930.

Additional & emended bibliography: Beauverd, Bull. Herb. Boiss., sér. 2, 8: 986--988, fig. 1 A--G. 1909; Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 17: 498. 1969.

Illustrations: Beauverd, Bull. Herb. Boiss., sér. 2, 8: 987, fig. 1 A—G. 1909.

ERIOCAULON DECANGULARE L.

Emended synonymy: Eriocaulon decangulare L. apud Reich. in L., Syst. Pl. 1: 244. 1779. Eriocaulon decangulare Michx. ex Beck, Bot., ed. 1, 370. 1833 [not E. decangulare Hill, 1799, nor Hope, 1770, nor Huds., 1959, nor Hull, 1841, nor Lightf., 1777, nor Walt., 1788, nor Willd., 1841].

Additional bibliography: L., Sp. Pl., 1: 87 (1753) and ed. 2, 1: 129. 1762; Hope, Phil. Trans. Roy. Soc. Lond. 59: pl. 12. 1770; J. A. Murr. in L., Syst. Veg., ed. 12, 109. 1774; Reich. in L., Syst. Pl. 1: 244. 1779; J. A. Murr. in L., Syst. Veg., ed. 13, 1: 109 (1783) and ed. 14, 128. 1784; Palau y Verdera, Part. Práct. Bot. 1: 532. 1784; Jacq., Ind. Pl. 63. 1785; Lippert, Pflanzensyst. 1: 187—188. 1786; Pers. in L., Syst. Veg., ed. 15, 132. 1797; J. A. Murr. in L., Syst. Veg., ed. 15 nov., 106—107. 1798; Jolyclerc, Syst. Sex. Vég., ed. 1, pr. 1, 92. 1798; J. E. Sm. in Sowerby, Engl. Bot. 11: pl. 733. 1800; Jolyclerc, Syst. Sex. Vég., ed. 1, pr. 2, 92. 1803; Mouton-Fontenille in L., Syst. Pl. 1: 148. 1804; J. E. Sm., Fl. Brit. 3: 1010. 1804; J. E. Sm. in Rees, Cycl. 13: Eriocaulon. 1809; Jolyclerc, Syst. Sex. Vég., ed. 2, 1: 101. 1810; Hook., Fl. Scot. 1: 270. 1821; Spreng. in L., Syst. Veg., ed. 16, 3: 775. 1826; J. E. Sm., Engl. Fl. 4: 140. 1828; Lodd., Bot. Cab. 14: pl. 1310. 1828; Curtis, Bot. Mag. 59: pl. 3126. 1832; Beck, Bot., ed. 1, 370. 1833; Kunth, Enum. Fl. 3: 540, 543—544, 563, & 580. 1841; A. Wood, Class-book, ed. 2, pr. 1, 564 (1847), ed. 2, pr. 2, 564 (1848), and ed. 10, pr. 1, 564. 1848; A. Gray, Man. Bot., ed. 1, 515. 1848; Beck, Bot., ed. 2, pr. 1, 370. 1848; A. Wood, Class-book, ed. 10, pr. 2, 564 (1849), ed. 10, pr. 3, 564 (1850), ed. 17, 564 (1851), ed. 23, 564 (1851), ed. 29, 564 (1853), ed. 35, 564 (1854), ed. 41, pr. 1, 564 (1855), and ed. 41, pr. 2, 564. 1856; A. Gray, Man. Bot., ed. 2, pr. 1, 489. 1856; Krieskern, Ann. Rep. N. J. Geol. Surv. 33. 1856; Beck, Bot., ed. 2, pr. 2, 370. 1856; A. Gray, Man. Bot., ed. 2, pr. 2, 489 (1858) and pr. 3, 489. 1859; A. W. Chapm., Fl. South. U. S., ed. 1, pr. 1, 503. 1860; C. Mull. in Walp., Ann. 5: 925 & 929 (1860) and 6: 1170. 1861; A. Wood, Class-book, [ed. 42], pr. 1, 729. 1861; A. Gray, Man. Bot., ed. 3, 489 (1862) and ed. 4, pr. 1, 489. 1863; A. Wood, Class-book, [ed. 42], pr. 2, 729. 1863; A. Gray, Man. Bot., ed. 4, pr. 2, 489. 1864; A. W. Chapm., Fl. South. U. S., ed. 1, pr. 2, 503. 1865; A. Wood, Class-book, [ed. 42], pr. 3, 729 (1865), and pr. 4, 729. 1867; A. Gray, Man. Bot., ed. 5, pr. 1, 549 (1867) and pr. 2, 549. 1868; A. Wood, Class-book, [ed. 42], pr. 5, 729. 1868; Beck, Bot., ed. 2, pr. 3, 370. 1868; A. Gray, Field For. & Gard. Bot., ed. 1, pr. 1, 352 (1868) and pr. 2, 352. 1869; A. Wood, Class-book, [ed. 42], pr. 6, 729 (1869) and pr. 7, 729. 1870; A. Wood, Am. Bot. & Flor., ed. 1, pr. 1, 355. 1870; A. Gray, Man. Bot., ed. 4, pr. 3, 489. 1870; A. Wood, Am. Bot. & Flor., ed. 1, pr. 2, 355 (1871) and pr. 3, 355. 1872; A. W. Chapm., Fl. South. U. S., ed. 1, pr.

3, 503. 1872; A. Wood, Class-book, [ed. 42], pr. 8, 729. 1872; A. Wood, Am. Bot. & Flor., ed. 1, pr. 4, 355 (1873) and pr. 5, 355. 1874; O. R. Willis, Cat. Pl. N. J. 67. 1874; A. Wood, Am. Bot. & Flor., ed. 1, pr. 6, 355. 1875; A. Wood, Class-book, [ed. 42], pr. 9, 729. 1876; A. Gray, Man. Bot., ed. 5, pr. 8, 549 (1878) and pr. "8" [=9], 549. 1880; A. Gray, Field For. & Gard. Bot., ed. 1, pr. 3, 352. 1880; A. Wood, Class-book, [ed. 42], pr. 10, 729. 1881; A. W. Chapm., Fl. South. U. S., ed. 2, pr. 1, 503 (1883), ed. 2, pr. 2, 503 (1884), ed. 2, pr. 3, 503 (1887), and ed. 2, pr. 4, 503. 1889; S. Wats. & Coult. in A. Gray, Man. Bot., ed. 6, pr. 1, 567 (1889) and pr. 2, 567. 1890; A. W. Chapm., Fl. South. U. S., ed. 2, pr. 5, 503 (1892) and ed. 3, 530. 1897; Keller & S. Br., Handb. Fl. Philad. 92. 1905; G. T. Stevens, Ill. Guide Flow. Pl. 114 & 115, pl. 9, fig. 5. 1910; W. Stone, Ann. Rep. N. J. State Mus. 1910: [Pl. South. N. J.] 323 & 325, pl. 28, fig. 2. 1912; N. Taylor, Guide Wild Fls. 7 & 323. 1928; Stapf, Ind. Lond. 3: 90. 1930; W. C. Grimm, Recog. Flow. Wild Pl. 36 & 37. 1968; Moldenke, Phytologia 18: 175, 187, 188, & 379--381. 1969; Rogerson, Rickett, & Becker, Bull. Torr. Bot. Club 96: 387. 1969.

Additional & emended illustrations: Lodd., Bot. Cab. 14: pl. 1310 [in color]. 1828; Curtis, Bot. Mag. 59: pl. 3126 [in color]. 1832; Britton & Br., Ill. Fl., ed. 1, 1: 372, fig. 901. 1896; G. T. Stevens, Ill. Guide Flow. Pl. 115, pl. 9, fig. 5. 1910; W. Stone, Ann. Rep. N. J. State Mus. 1910: [Pl. South. N. J.] pl. 28, fig. 2. 1912; Britton & Br., Ill. Fl., ed. 2, 1: 455, fig. 1143. 1913; W. C. Grimm, Recog. Flow. Wild Pl. 37. 1968.

The Stone (1912) work cited in the bibliography of this species is often cited as "1911", but actually was not published until January 26, 1912.

Grimm (1968) informs us that he has seen this plant with a flower stalk "1 to 3 feet tall which is 10 or 12-angled". Wood (1847) records the additional vernacular name "tall pipewort" for this plant. McDaniel found the plant common in low bogs and forming "large clumps 1 meter wide, scattered" on flats in Mississippi, while Webster & Wilbur found it in "savanna areas of longleaf pine and loblolly" there. These same collectors, in Texas, found it to be "common in low moist areas of woods of longleaf pine and some hardwoods, with open grassy areas". The Correll collection shows remarkably small flowering heads.

The Meebold 28095 collection, cited below, is a mixture with a species of Xyris. Material of E. decangulare has been misidentified and distributed in herbaria under the names E. gnaphaloides Michx. and E. lineare Small. On the other hand, the Herb. Zuccarini s.n. [Texas], distributed as E. decangulare, is actually E. decangulare var. minor Moldenke, while Herb. Schreber s.n. and R. G. Mills 43-90 are E. pellucidum Michx.

Additional citations: NEW JERSEY: Atlantic Co.: Pretz 2098 [10866] (Mu). Ocean Co.: E. S. Burgess s.n. [Manchester] (N); Curtiss s.n. [Manchester, Sept. 24, '75] (N); Lighthipe s.n.

[9-1-1880] (Mu). PENNSYLVANIA: Northampton Co.: Moser s.n. [Bethlehem] (Mu). County undetermined: Muhlenberg 1181 (Mu—331). DELAWARE: Sussex Co.: G. R. Proctor 2882 (Se—113481). MARYLAND: Prince Georges Co.: F. G. Meyer 9236 (Se—223258). VIRGINIA: County undetermined: Collector undesignated 310 (Mu—186). NORTH CAROLINA: Alexander Co.: Radford & Stewart 1657 (N). Carteret Co.: Blomquist 15262 (N). Columbus Co.: C. R. Bell 12710 (N); A. A. Heller 14112 (Se—88005). Cumberland Co.: C. Knox s.n. [July 19, 1942] (Se—202570). Dare Co.: P. O. Schallert s.n. [July 12, '41] (Se—112620). SOUTH CAROLINA: Berkeley Co.: Ahles & Haes-loop 30671 (Se—199081). Darlington Co.: Radford & Stewart 397 (N). Kershaw Co.: A. E. Radford 44243 (Se—212807). GEORGIA: Douglas Co.: Cronquist 5425 (M1). FLORIDA: Duval Co.: Curtiss 3016 (Mu—364), s.n. [Jacksonville, April 1877] (N). Escambia Co.: Meebold 28096 (Mu), 28097 (Mu); M. Morgan P.1 (Se—98844). Hernando Co.: R. A. Howard 12953 (Se—163441). Marion Co.: Meebold 28095, in part (Mu, Mu). Palm Beach Co.: Meebold 28094 (Mu). Seminole Co.: P. O. Schallert 3961 (Mu). MISSISSIPPI: Covington Co.: Webster & Wilbur 3373 (N). Forrest Co.: S. McDaniel 3305 (N). Harrison Co.: S. McDaniel 3356 (N). TEXAS: Jasper Co.: Correll & Correll 12516 (N). Tyler Co.: Webster & Wilbur 3199 (N). LOCALITY OF COLLECTION UNDETERMINED: Bischoff s.n. [Ex Amer. boreali 1823] (Mu—193); Bosc s.n. (Mu—320); Herb. Zuccarini s.n. [Amerika septr.] (Mu—195).

ERIOCAULON DECANGULARE var. LATIFOLIUM Chapm.

Additional bibliography: Moldenke, Phytologia 18: 84. 1969.

McDaniel describes this plant as "common" in low bogs, flowering and fruiting in August.

Additional citations: MISSISSIPPI: Harrison Co.: S. McDaniel 3358 (N).

ERIOCAULON DECANGULARE var. MINOR Moldenke

Additional bibliography: Moldenke, Phytologia 18: 175. 1969.

Additional citations: TEXAS: County undetermined: Herb. Zuccarini s.n. [Texas] (Mu—194).

ERIOCAULON DECEMFLOSUM Maxim.

Additional & emended bibliography: Maxim., Dec. Pl. Asiat. 8: 7. 1893; Komarov, Fl. Mansh. 1: 418. 1901; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 158 (1902) and 501. 1906; Stapf, Ind. Lond. 3: 90. 1930; Komarov & Alis., Opred. Rast. Dal'nevost. Kr. 1: 340. 1931; Steinberg in Komarov & Schischkin, Fl. U. S. S. R. 3: 496, pl. 27, fig. 1 a—d (1935) and Engl. transl., 393. 1964; Moldenke, Phytologia 18: 84 & 353—356. 1969; Tatew. & Ishizuka, Sapp. Bull. Bot. Gard. Hokk. Univ. 2: 21, 22, & 30. 1969.

The original Maximowicz reference (1893) in the bibliography of this taxon is sometimes cited as "1892" and was erroneously

cited to Bull. Acad. Sci. St.-Petersb. by Durand & Jackson (1902).

Tatewaki & Ishizuka (1969) report that this species grows in the Eriophorum gracile association, as well as in the association of that species with Phragmites communis and Carex limosa and in association with C. middendorffii in Japan.

ERIOCAULON DECENFLORUM f. COREANUM (H. Lecomte) Nakai

Additional synonymy: Eriocaulon decemflorum coreanum Nakai apud Stapf, Ind. Lond. 3: 90. 1930.

Additional & emended bibliography: Nakai in Matsumura, Icon. Fl. Koisikav. 2: 47, pl. 108. 1914; Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 18: 84. 1969.

Illustrations: Nakai in Matsumura, Icon. Fl. Koisikav. 2: pl. 108. 1914.

ERIOCAULON DECIPIENS N. E. Br.

Additional bibliography: Moldenke, Phytologia 18: 48. 1968.

Robinson found this plant growing in bogs, flowering and fruiting in June.

Additional citations: ZAMBIA: E. A. Robinson 3744 (Mu, Z).

ERIOCAULON DEIGHTONII Meikle

Additional bibliography: Winner, Biol. Abstr. 49: 11782. 1968; Moldenke, Phytologia 18: 84. 1969.

ERIOCAULON DEPAUPERATUM Merr.

Additional bibliography: Van Royen, Blumea 10: 127. 1960; Moldenke, Phytologia 18: 49—50. 1968.

ERIOCAULON DEPRESSUM R. Br.

Additional bibliography: J. E. Sm. in Rees, Cycl. 13: Eriocaulon. 1809; Spreng. in L., Syst. Veg., ed. 16, 3: 776. 1826; C. Müll. in Walp., Ann. 5: 925 & 927 (1860) and 6: 1170. 1861; Moldenke, Phytologia 18: 175 & 179. 1969.

ERIOCAULON DESLANDESII Alv. Silv.

Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 199. 1965; Moldenke, Phytologia 18: 50—51. 1968.

ERIOCAULON DIAGUISENSE Bourdu

Additional & emended bibliography: Bourdu, Bull. Soc. Bot. France 104: 156—158, fig. A—F. 1957; Moldenke, Phytologia 18: 51. 1968.

Illustrations: Bourdu, Bull. Soc. Bot. France 104: 157, fig. A—F. 1957.

Bourdu (1957) says "Cette description s'applique à des échantillons en parfait état mais dont la floraison est légèrement avancée....Les pétales libres des fleurs ♀ et le nombre réduit des étamines (3) sont des caractères qui, associés, correspondent normalement, dans la famille des Eriocaulacées, au genre Paspalanthus. Il nous a paru cependant logique de considérer cette petite

plante comme un Eriocaulon pour des deux raisons principales suivantes: 1. La colonne creuse ('petalorum tubus') qui, dans les fleurs mâles porte les pétales et les étamines est ici bien développée comme c'est le cas exclusivement chez les Eriocaulon. 2. La présence de petites glandes noires au sommet interne des pétales est un caractère des deux genres: Eriocaulon et Mesanthemum. On peut donc considérer la réduction du nombre des étamines comme un caractère secondaire. Ce ne serait pas un cas isolé dans le genre Eriocaulon: les E. griseum Koern. du Brésil, E. achiton Koern. et E. minutum Hook. de l'Inde (Malabar et Bengale) ont des fleurs mâles très comparables à celles de l'espèce décrite ici. Ces dernières espèces possèdent une tige et les pédoncules des capitules sont nets et plus ou moins allongés. L'absence de pédoncule est rare dans la famille des Eriocaulacées. On n'observe ce caractère que chez les Paepalanthus guyanensis Klotzsch. (Guyane anglaise), P. scleranthus Ruhl. (Brésil) et P. leucocephalus Ruhl. (Brésil). Dans toutes ces espèces du genre Paepalanthus le capitule et les feuilles sous-jacentes sont portés à l'extrémité d'une tige plus ou moins longue et ramifiée. Dans le P. sessiliflorus le capitule est également sessile et, de plus, la tige est nulle. L'aspect général de cette dernière espèce est donc très voisin de celui de l'espèce décrite ici, le Paepalanthus est toutefois nettement plus petit. Ne possédant aucune description des fleurs de Paepalanthus sessiliflorus (dont les deux synonymes sont: Eriocaulon sessiliflorum et Dupatya sessiliflorum) il est bien difficile de pousser la comparaison plus avant. L'espèce décrit n'a été rencontrée qu'en un point très précis de la Guinée française: à mi-pente du versant NE du petit plateau de Diaguissa qui limite vers le Sud de col de Dalaba (1.200--1.300 m). Cette espèce se développe sur une fine couche de terre (1 à 10 cm. d'épaisseur) qui borde les dalles latéritiques. Cette zone est temporairement très humide et on y trouve en association ouverte: Eriocaulon remotum H. Lecomte, Eriocaulon plumale N. E. Br., Eragrostis diplachnoides Steud., Utricularia tribracteata, Belmontia Chevalieri H. des Abbayes et R. Schnell, etc..."

ERIOCAULON DIANAE Fyson

Additional bibliography: C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. repr. 2, 8 [3]: 1124--1125, 1128, & 1333. 1956; Moldenke, Phytologia 18: 85, 432, 434, & 435. 1969.

This species has been found growing in savanna woods, at altitudes of 100 to 3000 feet, flowering and fruiting in October. Hosseus states that it has gray-blue flowers and is abundant in damp places in Thailand.

Additional citations: THAILAND: Hosseus 117 (Mu-403).

ERIOCAULON DIANAE var. LONGIBRACTEATUM Fyson

Additional bibliography: C. E. C. Fischer in Gamble, Fl.

Presid. Madras, ed. repr. 2, 8 [3]: 1128 & 1333. 1956; Moldenke, *Phytologia* 18: 52--54 & 435. 1968.

Hosseus found this plant in damp places in savanna woods, at 100 meters altitude, where he says that it forms rosettes and is "abundant", with gray-blue inflorescences, flowering and fruiting in October. The Stocks, Law &c. collection cited below was originally distributed as E. xeranthemum Mart., but bears a notation by Schultes, in his own handwriting: "Eriocaulon Rouxianum Stdl. ? E. minimum Lam.? Certe non est E. xeranthemum Mart." Material has also been misidentified and distributed in herbaria as E. truncatum Hamilt. On the other hand, the Santapau 19702, distributed as E. diana var. longibracteatum, is actually E. sollyanum Royle.

Additional citations: INDIA: Kerala: Stocks, Law &c. s.n. [Malabar, Concan &c.] (Mu--263). State undetermined: Helper 373 [India orientalis] (Mu--373). THAILAND: Hosseus 102 (Mu--402).

ERIOCAULON DIANA var. RICHARDIANUM Fyson

Additional bibliography: C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. repr. 2, 8 [3]: 1125, 1128, & 1333. 1956; Moldenke, *Phytologia* 18: 54. 1968.

ERIOCAULON DICLINE Maxim.

Additional & emended bibliography: Maxim., Dec. Pl. Asiat. 8: 21. 1893; Mak., Bot. Mag. Tokyo 8: 506. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 158 (1902) and 501. 1906; Moldenke, *Phytologia* 18: 85. 1969.

The original Maximowicz publication of this taxon (1893) is erroneously cited to Bull. Acad. Sci. St.-Petersb. by Durand & Jackson (1902) and by me (1968). This part of Maximowicz's work was apparently only published separately.

ERIOCAULON DICTYOPHYLLUM Körn.

Additional bibliography: C. Müll. in Walp., Ann. 5: 930 (1860) and 6: 1170. 1861; Angely, Fl. Anal. Paran., ed. 1, 199. 1965; Moldenke, *Phytologia* 18: 175. 1969.

The type of Paepalanthus dictyophyllum was collected by Carl Friedrich Philipp von Martius near the town of Salgado, Minas Gerais, Brazil, in August, 1818, and is deposited in the herbarium of the Staatssammlung in Munich, where it was photographed by Macbride as his type photograph number 18686. This collection is also a cotype collection of Eriocaulon dictyophyllum Körn.

Additional & emended citations: BRAZIL: Minas Gerais: Martius s.n. [prope vicum Salgado, Aug. 1818; Macbride photos 18686] (Mu--197--cotype), s.n. [Prope Salgado] (Mu--196--cotype). Santa Catarina: Smith & Reitz 9187 (Rf); Ule 1382, in part (Ac). State undetermined: J. E. Pohl s.n. [in Brasilia] (Mu--198).

ERIOCAULON DREGEI Hochst.

Additional bibliography: Walp., Ann. 1: 891. 1849; C. Müll. in Walp., Ann. 5: 926 & 944 (1860) and 6: 1170. 1861; Moldenke, Phytologia 18: 175--176 & 277. 1969.

Ward found this plant growing with other hygrophilous vegetation in moist soil of a small hillside "vlei", at an altitude of 50 feet, flowering and fruiting in September.

Additional citations: SOUTH AFRICA: Natal: C. J. Ward 3490 (Mu).

ERIOCAULON DUTHIEI Hook. f.

Additional bibliography: H. Lecomte, Journ. de Bot. 21: 89 & 93. 1908; H. Lecomte, Fl. Gén. Indo-Chine 7: 3 & 15--16. 1912; Moldenke, Phytologia 18: 176. 1969.

ERIOCAULON EBERHARDTII H. Lecomte

Additional bibliography: H. Lecomte, Fl. Gén. Indo-Chine 7: 2 & 4. 1912; Moldenke, Phytologia 18: 176. 1969.

ERIOCAULON ECHINACEUM Van Royen

Additional & amended bibliography: Van Royen, Blumea 10: 128, 129, & 131--132, fig. 1D. 1960; D. N. F. Kiehl, Blumea 10: 657. 1960; Moldenke, Phytologia 18: 85. 1969.

Illustrations: Van Royen, Blumea 10: 129, fig. 1D. 1960.

This species is said to be based on Nurkas 241, collected on the island of Celebes, and is apparently known thus far only from the type collection.

ERIOCAULON ECHINULATUM Mart.

Additional bibliography: C. Müll. in Walp., Ann. 5: 926 & 935 (1860) and 6: 1170. 1861; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 25. 1888; C. H. Wright, Journ. Linn. Soc. Lond. Bot. 36: 199. 1903; H. Lecomte, Journ. de Bot. 21: 89 & 93. 1908; H. Lecomte, Fl. Gén. Indo-Chine 7: 3 & 14--15. 1912; Moldenke, Phytologia 18: 176. 1969.

ERIOCAULON EHRENBERGIANUM Klotzsch

Additional bibliography: C. Müll. in Walp., Ann. 5: 930 (1860) and 6: 1170. 1861; Moldenke, Phytologia 18: 176--177, 303, 304, & 325. 1969.

Recent collectors have found this species growing in loamy soil in the water of small ponds, flowering and fruiting in February, April, and August. McVaugh describes the flower-heads as "white" and found the plant growing in open pine-oak woodlands with seepage areas on hillsides and in cleared and grazed areas in pine-oak woods, "locally abundant with Utricularia and other aquatics".

There appears to be some question about the correct number for the Schaffner collection cited below. The original label accompanying it is inscribed "436", but this number was later crossed out by pen, with no new one substituted. Lacking any further information, I am continuing to use the original number.

Additional citations: MEXICO: Federal District: J. G. Schaffner 436 (Mu—363). Hidalgo: Pringle 8989, in part [Canales Station] (Mu—388, Mu—399, Mu). Jalisco: R. McVaugh 23493 (Ip). México: La Llave s.n. [Toluca, Sept. 1830] (Mu—386). Michoacán: Barkley, Paxson, & Webster 2736 (W—2367450); R. McVaugh 22500 (Ip).

ERIOCAULON ELEGANTULUM Engl.

Additional bibliography: Moldenke, *Phytologia* 18: 62. 1968.

Holst found this species growing in meadows, flowering and fruiting in June.

Additional citations: TANGANYIKA: Holst 3181 (Mu—346).

ERIOCAULON ELENORAE Fyson

Additional bibliography: C. E. C. Fischer in Gamble, *Fl. Presid. Madras*, ed. repr. 2, 8 [3]: 1123, 1127, & 1333. 1956; Moldenke, *Phytologia* 18: 86 & 278. 1969.

Material of this species has been misidentified and distributed in herbaria as E. sexangulare L.

Additional citations: INDIA: Kerala: Stocks, Law &c. s.n. [Malabar, Concan &c.] (Mu—253).

ERIOCAULON ELICHRYSOIDES Bong.

Additional bibliography: Bong., *Mém. Acad. Imp. Sci. St.-Pétersb.*, sér. 6, 3: pl. 27. 1835; C. Müll. in Walp., *Ann.* 5: 930 (1860) and 6: 1170. 1861; Beauverd, *Bull. Herb. Boiss.*, sér. 2, 8: 283, fig. 9A (1908) and 987 & 988. 1909; Stapf, *Ind. Lond.* 3: 90. 1930; Moldenke, *Phytologia* 18: 177, 253, & 277. 1969.

Illustrations: Bong., *Mém. Acad. Imp. Sci. St.-Pétersb.*, sér. 6, 3: pl. 27. 1835; Beauverd, *Bull. Herb. Boiss.*, sér. 2, 8: 987. 1909.

The initial letter of the specific epithet of this taxon is uppercased by Müller (1861).

ERIOCAULON ENSIFORME C. E. C. Fischer

Additional & emended bibliography: C. E. C. Fischer in Gamble, *Fl. Presid. Madras*, ed. 1, 9: 1607 & 1618 (1931) and ed. repr. 2, 8 [3]: 1120—1121, 1126, & 1333. 1956; Moldenke, *Phytologia* 18: 87. 1969.

ERIOCAULON EPAPILLOSUM Ruhl.

Additional bibliography: Moldenke, *Phytologia* 18: 87—88 & 94. 1969.

ERIOCAULON EQUISETOIDES Van Royen

Synonymy: Eriocaulon setaceum Steen. apud Van Royen, *Blumea* 10: 132, in syn. 1960 [not E. setaceum Auct. ex Ruhl., 1903, nor Benth, 1893, nor Crantz, 1893, nor Heyne, 1832, nor Kunth, 1860, nor L., 1753, nor Lour., 1790, nor Rottl., 1960, nor Wall., 1893, nor Wight, 1832, nor Willd., 1959]. Eriocaulon setaceum Auct. ex Back-

er & Bakh., Fl. Java 3: 25, in syn. 1968.

Additional & emended bibliography: Van Steenis, Trop. Natuur 25: 107. 1936; Backer, Noodfl. Java 10a: fam. 214: 1. 1949; Van Royen, Blumea 10: 128, 129, & 132--133, fig. 1E. 1960; D. N. F. Kiehl, Blumea 10: 657. 1960; Backer & Bakh., Fl. Java 2: 25. 1968; Moldenke, Phytologia 18: 88. 1969.

Illustrations: Van Royen, Blumea 10: 129, fig. 1E. 1960.

The type of this species is Van Steenis 7542 from Java, but Van Royen avers that possibly Teysmann s.n. from Banka and Van Vreeden s.n. from Sumatra may represent the same species.

Backer & Bakhuizen van den Brink (1968) describe this species as follows: "Leaves partly rather closely set on a submerged, erect stem, partly rosulate on the top of the stem, floating, 4--6 cm. long, very narrow, 1-nerved, glabrous. Heads umbellate on the top of the stem, each borne on a glabrous, 4--15 cm long peduncle, greyish green; bracts glabrous, outer ones suborbicular, inner ones obovate; receptacle villous; ♂: sepals almost entirely connate into a sheath; petals 3, minute; ♀: sepals 3, obovate, vaulted, apically pubescent; petals 3, lanceolate-spatulate. Stem pale, with wide air-channels, basally with vertical rows of roots. Delicate. 0.05--0.20; Indramayu (W.); below 50; flooded rice-fields (E. setaceum Auct., non L.)".

ERIOCAULON EURYPEPLON Körn.

Additional bibliography: C. Müll. in Walp., Ann. 5: 927 & 946 (1860) and 6: 1170. 1861; Moldenke, Phytologia 18: 177. 1969.

Additional citations: INDIA: State undetermined: Hügel s.n. [Ind. or.] (Mu--200).

ERIOCAULON FABERI Ruhl.

Additional bibliography: C. H. Wright, Journ. Linn. Soc. Lond. Bot. 36: 199. 1903; Moldenke, Phytologia 18: 88. 1969.

ERIOCAULON FENESTRATUM Bojer

Synonymy: Eriocaulon fenestralis Bojer, in herb.

Additional bibliography: C. Müll. in Walp., Ann. 5: 926 & 944 (1860) and 6: 1171. 1861; Massee, Grevillea 22: 67. 1894; G. P. Clinton, Journ. Myc. 8: 137. 1902; Moldenke, Phytologia 18: 88--89, 378, & 433. 1969.

Müller (1861) spells the surname of this binomial's author "Boier", but correctly in his 1860 reference. Massee (1894) describes a smut fungus, Cintractia eriocauli Massee, from this species in Madagascar. Clinton (1902) corrected the name of the fungus to Ustilago eriocauli (Massee) Clint. in spite of the fact that he had himself published an Ustilago eriocauli Clint. in 1901, claiming that the two fungi are conspecific.

Additional citations: MADAGASCAR: Bojer s.n. [prov. Emirna] (Mu--202--isotype), s.n. [in insula Madagascar] (Mu--201).

ERIOCAULON FISTULOSUM R. Br.

Additional bibliography: J. E. Sm. in Rees, Cycl. 13: Eriocaulon. 1809; C. Müll. in Walp., Ann. 5: 925 & 927 (1860) and 6: 1171. 1861; Banks & Soland., Bot. Cook's Voy. 3: pl. 317. 1905; Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 18: 177 & 368. 1969.

Illustrations: Banks & Soland., Bot. Cook's Voy. 3: pl. 317. 1905.

The binomial, Eriocaulon fistulosum R. Br., is usually cited to R. Br., Prodr. Fl. Nov. Holl. (1810). However, it was first validly published, and credited to Brown, by J. E. Smith in Rees, Cycl. (December, 1809), where the description is given as follows: "E. fistulosum. Brown MSS. — Stalks aggregate, cylindrical, striated. Leaves smooth, twice as long as the sheaths. Head hemispherical. Inner calyx-scales obovate, pointed. — Native of New Holland. — Stalks a span high. Leaves about half as long, or more, taper-pointed, smooth, rather turgid. Heads small, brownish."

The E. fistulosum Nees (1959) is a synonym of E. parkeri B. L. Robinson.

ERIOCAULON FLUVIATILE Trimen

Additional bibliography: H. Lecomte, Journ. de Bot. 21: 89 & 90. 1908; H. Lecomte, Fl. Gén. Indo-Chine 7: 2 & 6—7. 1912; Moldenke, Phytologia 18: 177. 1969.

Lecomte (1908) reduces E. tonkinense Ruhl. to synonymy under E. fluviatile.

ERIOCAULON FRIESIORUM Bullock

Additional bibliography: Moldenke, Phytologia 18: 91. 1969.

Emended citations: KENYA: Hedberg 1602 (Ac).

ERIOCAULON FULIGINOSUM C. Wright

Additional & emended bibliography: Moldenke, Known Geogr. Distrib. Erioc. 4, 35, & 39—41. 1946; Moldenke, Phytologia 18: 92. 1969.

ERIOCAULON GAMBLEI C. E. C. Fischer

Additional & emended bibliography: C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. 1, 9: 1617—1618 & 1620 (1931) and ed. repr. 2, 8 [3]: 1126, 1128, & 1333. 1956; Moldenke, Phytologia 18: 93. 1969.

ERIOCAULON GIBBOSUM Körn.

Additional & emended bibliography: C. Müll. in Walp., Ann. 5: 930 (1860) and 6: 1171. 1861; Korn. in Mart., Fl. Bras. 3 (1): 489—490 & 500, pl. 62, fig. 1. 1863; Ruhl. in Pilg., Engl. Bot. Jahrb. 30: 146—147. 1901; Wettst., Handb. Syst. Bot., ed. 2, 814. 1911; Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 18: 177 & 342. 1969.

Additional & emended illustrations: Körn. in Mart., Fl. Bras.

3 (1): pl. 62, fig. 1. 1863; Wettst., Handb. Syst. Bot., ed. 2, 814. 1911.

The Ruhland (1901) work cited in the bibliography above is often erroneously cited as "1902", but was actually issued on July 2, 1901. The "1902" is merely the volume title-page date.

Körnicke's var. brevifolium is regarded by me as the typical form of this species because it is the one first described by him and is the one illustrated by him without any varietal designation. It is based on G. Gardner 5275 from Minas Gerais, Brazil, and Lund s.n. [ad rivulos prope Uberava, Julio], also from Minas Gerais. It is described as "foliis brevibus 7--9-nerviis, 3--7 lin. longis, medio usque 1 lin. latis".

L. Riedel 2416, cited below, seems to be a mixture of the typical form of the species [represented by the Munich specimen] and var. longifolium Körn. [as cited by Körnicke], unless, of course, the longer leaves were once present on the Munich specimen, too, but have rotted off, or had rotted off before the plant was collected. It is possible that the variety is not a wellmarked one. The Weddell 2128 specimens cited by me previously are cotypes of var. longifolium Körn.

Emended citations: BRAZIL: Amapá: Murça Pires, Rodrigues, & Irvine 50900 (Rf). Goiás: L. Riedel 2416, in part (Mu--206). State undetermined: J. E. Pohl s.n. [Brasília] (Mu--205).

ERIOCAULON GIBBOSUM var. MATTOGROSSENSE Ruhl.

Additional & emended bibliography: Ruhl. in Pilg., Engl. Bot. Jahrb. 30: 146--147. 1901; Moldenke, Phytologia 18: 88, 93, & 94. 1969.

The Ruhland (1901) work cited in the bibliography above is often erroneously cited as "1902", but was actually issued on July 2, 1901. The "1902" is merely the volume title-page date.

ERIOCAULON GIBBOSUM f. VIVIPARUM Moldenke

Bibliography: Moldenke, Phytologia 18: 342. 1969.

This form differs from the typical form of the species in its viviparous flower-heads.

Citations: BRAZIL: Goiás: Luetzelburg 1440 (Mu--type).

ERIOCAULON GILGIANUM Ruhl.

Emended synonymy: Eriocaulon ciliisepalum Rendle, Cat. Afr.

Pl. Welw. 2 (1): 98. 1899.

Additional & emended bibliography: Rendle, Cat. Afr. Pl. Welw. 2 (1): 98. 1899; Engl. & Drude, Veget. Erde 9 (2): 265. 1908; Stapf, Ind. Lond. 3: 90. 1930; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 158--160, fig. 4--6 & 12, 161--162, 169, & 270--271, pl. 8, fig. 11 & 12. 1955; Moldenke, Phytologia 18: 177. 1969.

Additional & emended illustrations: Ruhl. in Engl., Pflanzenreich 13 (4-30): 99, fig. 13A. 1903; Engl. & Drude, Veget. Erde 9 (2): 265. 1908.

Recent collectors have found this plant in flower and fruit in

June. The Endlich 733a collection cited below is a mixture with something in the Cyperaceae.

Rendle (1899) based his E. ciliisepalum on two collections made by Welwitsch: (1) no. 2445, in damp fields formerly planted with Zea mays, very plentiful but only met with in a very few places, near Lopollo, at 5000 feet elevation, Huila, Angola, in May, 1860, and (2) no. 2445a, on mucous-boggy slopes at Morro de Lopollo, below the old fortress, Huila, in the end of May, 1860. He says of it "Near E. abyssinicum Hochst. but distinguished by its hairy receptacle and the ciliate sepals of the female flower"

ERIOCAULON GOMPHRENOIDES Kunth

Additional bibliography: C. Müll. in Walp., Ann. 5: 930 (1860) and 6: 1171. 1861; Moldenke, Phytologia 18: 87 & 99—100. 1969.

ERIOCAULON GRACILE Mart.

Additional & emended bibliography: C. Müll. in Walp., Ann. 5: 941 (1860) and 6: 1171. 1861; H. Lecomte, Journ. de Bot. 21: 89, 91, 109, & 131. 1908; H. Lecomte, Fl. Gén. Indo-Chine 7: 2 & 9. 1912; K. Larsen, Dansk Bot. Ark. 23: 379, 380, & 397, fig. 7-9. 1966; Ornduff, Reg. Veg. 55: 13 & 118. 1968; Moldenke, Phytologia 18: 178, 360, 432, & 434. 1969.

Illustrations: K. Larsen, Dansk Bot. Ark. 23: 380, fig. 7—9. 1966.

Larsen (1966) says that this species is "Distributed from N.E. India through Burma, N. Thailand to Laos, Cambodia, and Vietnam". He says, further, that "In this case very good meiotic metaphases were available in No. 5235 (Figs. 7—8) and the bivalents were well separated so there was no doubt about the number $n = 15$, furthermore, $2n = 30$ was counted in root tips of No. 6083 (Fig. 9). The chromosome morphology deviates rather a lot from that of E. achiton. In the first place there are great size differences among the chromosomes; secondly the largest chromosomes are nearly twice as long as in the preceding species [E. achiton]."

ERIOCAULON GRAPHITINUM F. Muell. & Tate

Additional synonymy: Eriocaulon graphitinum Ewart & Cookson apud Stapf, Ind. Lond. 3: 90. 1930.

Additional & emended bibliography: Ewart & Cookson in Ewart & Davies, Fl. N. Terr. 67 & 366, pl. 6. 1917; Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 18: 103. 1969.

Illustrations: Ewart & Cookson in Ewart & Davies, Fl. N. Terr. 366, pl. 6. 1917.

ERIOCAULON GREGATUM Körn.

Additional bibliography: C. Müll. in Walp., Ann. 5: 926 & 932 (1860) and 6: 1171. 1861; Moldenke, Phytologia 18: 103—104. 1969.

Additional citations: INDIA: Khasi States: Hooker & Thomson s.n. [Mont. Khasia, 4000 ped.] (Mu—199).

ERIOCAULON GRISEUM Körn.

Additional bibliography: C. Müll. in Walp., Ann. 5: 930 (1860) and 6: 1171. 1861; Körn. in Mart., Fl. Bras. 3 (1): 475, 479, & 500, pl. 60, fig. 3. 1863; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 23 & 25, fig. 12 G & H. 1888; Stapf, Ind. Lond. 3: 90. 1930; Bourdu, Bull. Soc. Bot. France 104: 156. 1957; Moldenke, Phytologia 18: 104. 1969.

Additional & emended illustrations: Körn. in Mart., Fl. Bras. 3 (1): pl. 60, fig. 3. 1863; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 23, fig. 12 G & H. 1888.

Additional citations: BRAZIL: Piahy: Martius s.n. [Mai 1819] (Mu—283—isotype).

ERIOCAULON GUADALAJARENSE Ruhl.

Additional bibliography: Moldenke, Phytologia 18: 104. 1969.

Material of this species has been misidentified and distributed in herbaria as E. benthami Kunth.

Additional citations: MEXICO: Jalisco: Pringle 1734 (Mu—367—isotype, Mu—368—isotype).

ERIOCAULON GUYANENSE Körn.

Emended synonymy: Eriocaulon guianense Körn. apud C. Müll. in Walp., Ann. 5: 927 & 947. 1860.

Additional bibliography: C. Müll. in Walp., Ann. 5: 927 & 947 (1860) and 6: 1171. 1861; Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 18: 104—105. 1969.

The initial letter of the specific epithet of this taxon is uppercased by Müller (1861). Goodland 302 is a mixture of this species with Philodice hoffmannseggii Mart. and Syngonanthus huberi Ruhl. Goodland found the plant growing in an open hog-wallow, in a marsh in grassland with scattered trees, the drainage impeded by a clay pen with a top of about 6 inches and a layer of 6 inches of light-gray sand, at an altitude of 350 feet, flowering and fruiting in August, the dominant plants of the association being Curatella, Byrsonima, Trachypogon, and Fimbri-stylis.

Additional & emended citations: GUYANA: Goodland 302, in part (Rf, W—2546172), 849 (Rf, W—2546174); Goodland & Persaud 616 (Ac, W—2546173). BRAZIL: Rio Branco: Ule 7667 (Ac).

ERIOCAULON HAMILTONIANUM Mart.

Additional bibliography: Mart., Nov. Act. Acad. Caes. Leopold.-carol. Nat. Cur. 17 (1): pl. 1. 1835; C. Müll. in Walp., Ann. 5: 926 & 945 (1860) and 6: 1171. 1861; Duthie, Fl. Upper Ganget. Plain 3: 318 & 320. 1929; Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 18: 178, 278, & 362. 1969.

Illustrations: Mart., Nov. Act. Acad. Caes. Leopold.-carol. Nat. Cur. 17 (1): pl. 1. 1835.

Material of this species has been misidentified and distributed in herbaria as E. subulatum N. E. Br. and E. zollingerianum

Körn.

Additional citations: INDIA: Assam: Herb. Kollmann s.n. [Gualpara] (Mu--208); Herb. Zuccarini s.n. [Gualpara] (Mu--207).

ERIOCAULON HANANOEOGOENSE Masamune

Additional bibliography: Moldenke, Phytologia 18: 107--108 & 255. 1969.

ERIOCAULON HENRYANUM Ruhl.

Additional bibliography: C. H. Wright, Journ. Linn. Soc. Lond. Bot. 36: 199. 1903; H. Lecomte, Journ. de Bot. 21: 89 & 92. 1908; H. Lecomte, Fl. Gén. Indo-Chine 7: 2 & 13. 1912; Fyson, Journ. Indian Bot. 2: 310. 1921; Van Royen, Blumea 10: 135. 1960; K. Larsen, Dansk Bot. Ark. 23: 379--381 & 397, fig. 10. 1966; Ornduff, Reg. Veg. 55: 13 & 118. 1968; Moldenke, Phytologia 18: 109-110 & 396. 1969.

Illustrations: K. Larsen, Dansk Bot. Ark. 23: 380, fig. 10. 1966.

Schneider describes the flower-heads of this species as "greenish-white". Fyson (1921) refers to Henry 9443 (a specimen in the Calcutta herbarium) as perhaps a distinct species "but is obviously closely related to E. longicuspis". He notes that it "has smaller leaves more like those of E. odoratum and smaller heads. The involucreal bracts are not reflexed."

Larsen (1966) says that E. henryanum is "A South Chinese species whose area ranges from Yunnan and Kwangtung to N. Thailand and N. Vietnam". He tells us that "The chromosome number was difficult to establish with certainty on account of the often densely packed metaphase plates. In one of the best, Fig. 10, 56 chromosomes could be distinguished, two of which perhaps have a SAT-constriction. The chromosomes, here, are again of another type than in those found in the two previous species [E. achiton & E. gracile], viz. short rod-shaped and nearly uniform. They are reminiscent of the type found in Luzula species. It should be added that some plates gave the numbers $2n = 57$ and 58, but in no case was it justifiable to interpret 60 entities. I am inclined to regard the species as an octoploid with the basic number 7."

Additional citations: CHINA: Yunnan: Maire 3965 (W--1291750); J. F. Rock 5349 (Mu), 5459 (Mu); C. K. Schneider 1874 (W--776268), 2946 (W--776675).

ERIOCAULON HERZOGII Moldenke, nom. nov.

Synonymy: Eriocaulon pterosepalum Herzog in Fedde, Repert. Spec. Nov. 29: 204, pl. 120, fig. e--i. 1931 [not E. pterosepalum Hayata, Icon. Pl. Formos. 10: fig. 30. 1921].

Bibliography: Hayata, Icon. Pl. Formos. 10: 55, fig. 30. 1921; Herzog in Fedde, Repert. Spec. Nov. 29: 204, pl. 120. 1931; A. W. Hill, Ind. Kew. Suppl. 9: 105. 1938; Moldenke, Known Geogr. Distrib. Erioc. 8 & 39. 1946; Moldenke, Known Geogr. Dis-

trib. Verbenac., [ed. 2], 206. 1949; Moldenke, *Phytologia* 3: 341. 1950; Moldenke, *Résumé* 89 & 482. 1959; Moldenke, *Phytologia* 18: 425. 1969.

Illustrations: Herzog in Fedde, *Repert. Spec. Nov.* 29: pl. 120, fig. e--i. 1931.

This species is based on Luetzelburg 21052, from a wet campo "almost in water", at Teju, and on Luetzelburg 21053, from a wet campo at Milho, both in Pará, Brazil, although Herzog was himself not certain of the exact location of these two localities. The plants were found flowering and fruiting in September.

The nomenclatural situation involving this species is a curious one. Hayata (1921), on page 55 and in the volume index of his work, cited above, published an "Eriocaulon petrosepalum", with a detailed description, and this name is recorded in the "Index Kewensis" (1929) as effectively and validly published. However, on the fig. 30 which accompanies his description he very plainly identifies the plant as "Eriocaulon pterosepalum", and this spelling of the name has been adopted by Stapf in his "Index Londinensis" (1930) and by Sasaki in his "Catalogue of the Government Herbarium" (1930), apparently on the assumption that the orthography accompanying the printed description was an inadvertent error, copied by some secretary making up the volume index, and that the orthography accompanying the illustration is the one intended by the author. I concur in this interpretation (although in some previous publications I adopted the orthography accompanying the text) since the sepals of the plant in question are indeed "winged" and are not "stony". In this case, Herzog's name plainly is a later homonym and must be replaced. Hayata's two binomials belong in the synonymy of E. sexangulare L. and the Simada 432, distributed as E. pterosepalum, is actually E. sexangulare.

Citations: BRAZIL: Amazonas: Luetzelburg 21052 [Macbride photos 18690] (Ja--47705--cotype, Mu--cotype, N--photo of cotype, N--cotype, W--photo of cotype), 21053 (Ja--47704--cotype, Mu--cotype, N--cotype, Z--cotype), 21056 (Ja--47706, N).

xERIOCAULON HESSII Moldenke

Additional & emended bibliography: H. Hess, *Bericht. Schweiz. Bot. Gesell.* 65: 170 & 173--174, pl. 9, fig. 2. 1955; Moldenke, *Phytologia* 18: 110 & 321. 1969.

ERIOCAULON HETEROCHITON Körn.

Additional bibliography: Moldenke, *Phytologia* 18: 178, 245, & 393. 1969.

ERIOCAULON HETEROGYNUM F. Muell.

Additional bibliography: Van Royen, *Nova Guinea, new ser.*, 10: 236. 1960; Moldenke, *Phytologia* 18: 175 & 178--179. 1969.

Van Royen (1960) cites Van Royen 4873 & 4904 from New Guinea as representing this species, but I have not as yet seen these

collections.

ERIOCAULON HETEROLEPIS Steud.

Additional bibliography: C. Müll. in Walp., Ann. 5: 926 & 941 (1860) and 6: 1171. 1861; Dalz. & Gibs., Bomb. Fl. 316. 1861; Moldenke, Phytologia 18: 179 & 278. 1969.

The initial letter of the specific epithet of this species is uppercased by Dalzell & Gibson (1861). The Wallich 6072b, distributed as E. heterolepis, is actually E. sollyanum Royle.

ERIOCAULON HETEROLEPIS var. NIGRICANS Körn.

Additional bibliography: Backer & Bakh., Fl. Java 3: 25—26. 1968; Moldenke, Phytologia 18: 179. 1969.

Backer & Bakhuizen van den Brink (1968) describe this taxon as follows: "All leaves in a radical rosette. Terrestrials. Interfloral bracts in their upper halves or on their tops with numerous short white hairs. Involucral bracts, peduncles and leaves glabrous; heads less than 8 mm across. Leaves at best 10 cm long, often much less. Heads globose-oblate, 4—7 mm across, blackish grey; interfloral bracts very dark-coloured, with a triangular, rather acute top; apical hairs short but not very minute, involucral bracts of old heads often reflexed and more or less concealed by the flowers; ♂ sepals 3, vaulted, connate into a unilaterally cleft sheath with a rounded, dark-coloured, short-hairy top; petals 3 (1 of them much the largest), all with a gland below the top; anthers 6, dark-coloured; ♀: sepals 3, pubescent, 2 of them navicular with a strongly keeled-winged back, the 3rd much narrower and less strongly vaulted; petals 3, with a gland below the top; style 3-fid. [to this point the description is identical with that of E. sollyanum]. Outermost involucral bracts oblong, obtuse, apically very faintly toothed; receptacle sparingly hairy. Leaves 3—8 cm long. 0.07—0.18; III, VIII; W. E., here and there; 20—800; swampy places; rare, but locally numerous."

ERIOCAULON HETEROPELON Alv. Silv.

Additional & emended bibliography: Alv. Silv., Fl. Serr. Min. 34, pl. 11. 1908; Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 18: 179—180. 1969.

Additional illustrations: Alv. Silv., Fl. Serr. Min. pl. 11. 1908.

ERIOCAULON HEUDELOTII N. E. Br.

Additional bibliography: Moldenke, Phytologia 18: 180—181. 1969.

Material of this species has been misidentified and distributed in herbaria as E. amboense Schinz and E. sexangulare L. Recent collectors describe the plant as an erect tufted annual, to 5 cm. tall, the heads almost black, and found it growing in "dambo" habitat as 1350 meters altitude, flowering and fruiting in June. Giess & Leipert describe it as "abundant".

REVIEW

Otto & Isa Degener

Having looked over the border into the clean, pine- and birch-covered hills and mountains of Finland from northern Sweden some years ago, one of the reviewers can understand how Dr. Yrjö Mäkinen (*) would be enraptured by his stay among the sun-scorched lava fields and the jungle-covered terrain of the Hawaiian Archipelago. His enthusiasm is expressed in his "Havaijin kasvistosta ja kasvillisuudesta" [On the Flora and Vegetation of the Hawaiian Islands], appearing in Eripainos. Luomon Tutkija 72 (3): 65--81. 1968.

The article interestingly describes the Hawaiian Islands within the scope of the title, and will undoubtedly arouse the envy of many European readers to visit this Paradise. The reviewers would suggest that they do so before "progress" and before "conservation", so often locally confused with exploitation, exterminate still more of the precious endemic biota.

Some obvious typographical errors should be corrected to read (pages 69, 76) Sadleria, (69) Jacquemontia, (69) D. aegyptium, (69) S. sericea var. fauriei, (71) P. sandwicensis, (74) Oreobolus, (76) A. rhipidoneuron, and (76) P. ternifolia. Some genera we, unlike many others, prefer to "split", thus getting such unfamiliar binomials as (77) Psilorhagma glauca, (77) Vachellia farnesiana and (71, 78) Chamaesyce spp. Some binomials used we should like to see changed or modified, such as: (69) Ipomoea pes-caprae to I. p. ssp. brasiliensis, (69) Vitex trifoliata to V. ovata, (69, 78) Digitaria henryi to D. adscendens, (69) Chenopodium sandwicense to C. oahuense, (70) Pandanus sp. to P. (probably) douglasii, (71) Alyxia olivaeformis to A. oliviformis, (71) Perrottetia sandwicensis to P. sandwicensis, (72) Lycopodium cernuum to L. c. var. crassifolium, (73) Psilotum complanatum to P. c. forma fosbergii, (73) Mariscus angustifolius to Machaerina angustifolia, (74) Psilotum nudum to P. n. var. oahuense, (74) Luzula campestris var. hawaiiensis to L. h., (75) Neurophyllodes tridentatum to N. tridens, (76) Pellaea tenuifolia to P. ternifolia, (77) Ipomoea alba to Calonyction aculeatum, (77) Ipomoea coerulea to I. indica?, (77) Lantana camara to L. c. var. aculeata, (77, 78) Tricholaena repens to Rhynchelytrum r., (77) Setaria lutescens to S. geniculata, (77) Melaleuca leucadendron to M. quinquenervia, (77) Araucaria excelsa to A. heterophylla, (78) Chloris inflata to C. barbata, and (78) Panicum purpurascens to Brachiaria mutica. We do not wish to imply that we consider all the above binomials used in the article wrong — there is opportunity for quibbling. We simply prefer the alternate ones we

are here suggesting.

Dr. Mäkinen expresses his belief that "The present number of native species may be around 2500" in the Hawaiian Archipelago, a figure commonly held by many workers. We believe this estimate, even for the year 1968, far too low.

In the early 1930s one of us devoted a few hours to estimating very roughly how many feet of bookshelf an illustrated Hawaiian Flora might occupy. He counted the number of species in certain genera recently monographed by such specialists as Hitchcock, Rock, Sherff, Skottsberg and Yuncker. Then he counted the number of species for the same genera appearing in Hillebrand's "Flora of the Hawaiian Islands", published in 1888. The entire Flora contained close to 1,000 Ferns and Flowering Plants. As the increase since 1888 for most of these "spot-check" genera was tremendous, he assumed the remaining genera in the Hawaiian flora, if similarly monographed, would very likely show a similar increase.

After consulting such literature, he next studied available topographic maps of the various islands from Niihau to Hawaii. Having botanized on the major ones he estimated the botanical No Man's Land on each, areas from which neither Hillebrand nor the later specialists had ever received specimens. He knew the flora of Kohoolawe, even though much of the top soil had blown away since the introduction of herbivores some endemics must have survived, was completely unknown; that of Niihau practically unknown; and the knowledge of the flora of Lanai most fragmentary. Regarding Kauai, the Kokee region mauka of Waimea Canyon was moderately well known, but little else of that ancient island deeply cut into valleys. Regarding Oahu, areas mauka of Honolulu and the summits of Kaala were revealing their botanical riches, but most of the Waianae and Koolau Ranges' flora was still not well known. Remember that to this day, due to the treacherously steep ridges, most workers botanize streambeds up to the first difficult ledges and cliffs or along the relatively safe knife edges of lateral ridges. The tapestry forests along the precipitous slopes are generally ignored of their wealth of peculiar endemics. Proof of this statement are the Degener & Hatheway voucher specimens deposited in leading botanical institutions of rarities from such risky field trips taken even near Honolulu.

Knowing how localized many Hawaiian taxa are in their distribution and realizing the tremendous areas of unexplored terrain, the reviewer did not estimate the number of native species in the early 1930s at around 2,500 but near ten times that figure.

Since that time, unfortunately, the holocaust of the endemic biota has been progressing at a tremendous pace (**) — axis deer even now with a more enlightened public have quietly been introduced to the Island of Hawaii! Though the native flora numbers presently far above "around 2500" species, it may soon decline to this trivial figure estimated by Dr. Mäkinen if conservationists of the World fail to act constructively.

(*) Dr. Yrjö Mäkinen, accompanied by Mrs. Mäkinen, resided in the Hawaiian Islands from September 1, 1965, to September 5, 1966. Though Docent in Botany at the University of Turku, Finland, he was on leave to accept a National Science Foundation grant, conducting research officially as Assistant Horticulturist at the University of Hawaii and as Visiting Professor at the Bernice Pauahi Bishop Museum. He is presently Professor of Botany, University of Turku.

(**) According to the Honolulu Star-Bulletin of August 28, 1969, the 40 blacktail deer introduced from Canada in 1961 have multiplied steadily until there are at least 400 in the Kokee area of Kauai!

BOOK REVIEWS

Alma L. Moldenke

"SEAWEEDS OF CAPE COD AND THE ISLANDS" by John M. Kingsbury, vii & 212 pp., illus., The Chatham Press, Chatham, Massachusetts 02633. 1969. \$12.50.

This area is the beloved vacation and home site of so many naturalist-oriented folks and of so many students of the biological sciences who will appreciate the author's short botanically descriptive and informative essays that accompany the Normans' fullpage black and white illustrations. The original drawings are artistically fine enough to have been displayed in art galleries of high quality and they are botanically accurate and attractive even to have been accepted by the famous Hunt Botanical Library. This spot on the map is geographically and ecologically especially interesting because it is a meeting point for the southerly directed Arctic currents and the northerly directed Gulf Stream. Their differences in temperature and tides account for differences in the algal flora and other associated biota and make the appeal of this book so much broader.

The plants are arranged according to the classical divisions of bluegreens, greens, browns and reds. There is a very brief key usable for swifter identification than picture-flipping. Much modern work on life cycles is given. Helpful derivation of scientific terms is provided. "Fucicola" is rendered "Fucus-loving" instead of Fucus-inhabiting. Among the parasitic red algae the author mentions that 90 percent occur only on hosts that are very closely related to the parasites. He reminds readers that the calcareous red algae are the primary agents of deposition in most coral reefs, forming their major

binding material and withstanding wave action more effectively.

This book makes a pleasant, but expensive, companion to Taylor's "Marine Algae of the Northeastern Coast of North America".

"THE PRAIRIE WORLD" by David F. Costello, xii & 242 pp., illus., Thomas Y. Crowell Company, New York 10003. 1969. \$7.95.

This book is a descriptive ecology of this land form in the United States, written by one who has known the area since his boyhood days, who has studied it scientifically all his professional life, who therefore loves it intimately, and who shares this knowledge and feeling in excellent descriptions.

The book is so readable that I went through it in one long sitting. Consider: "The prairie has always been dynamic, not only in its continual turnover of plant and animal constituents in each and every part of its expanse, but in the great boundary movements of the grassland itself. The north and south geographic drift of the whole grassland formation was caused by the irresistible advance and retreat of the Pleistocene glaciers." Also consider his account of the role of the Russian thistle (Salsola kali tenuifolia) whose tumbleweed "form enables it to run over the prairie with all the winds that blow. Its prodigious seed supply is dribbled out over a period of several months, since some of its twenty thousand seeds are loosely attached while others are virtually buried in its stems and branches. Seedlings can even grow from the seeds in these branches when they are covered with drifting soil. With the whims of the winds every bare area is sure to receive its supply of seeds and in spring to produce from one to several thousand seedlings per square yard. The resulting black-green carpet frequently dies because the seedlings compete with one another and wilt if life-giving rain is long delayed. But scattered plants on barren land produce three- to five-foot globes of wirelike branches with spiny bractlike leaves and greenish flowers that turn pink at maturity. Until they mature and dry, the plants make sedentary prickly shelters for rabbits, mice, and birds. Then when the roaring winds of autumn pluck them from their moorings, they become swift-moving balls that race across the landscape, jostle through fences, and pile up among streamside shrubs. When the wind shifts, they become free again to move in another direction and sow their seeds in every niche."

This book deals with the prairie as a grassland sea, describes its typical changes throughout the seasons, its plants, mammals, birds, insects, reptiles and amphibians, explains the work of its temporary and permanent water supplies and of such catastrophies as fire, drought, weed introductions, insect depredations and man.

There is an index, a bibliography, and an appendix listing places in our country where true prairie can still be observed. The author's own very well printed photographs enhance the text.

"THE MUTANTS OF MAIZE" by M. G. Neuffer, Loring Jones & Marcus S. Zuber, 74 pp., illus., Crop Science Society of America, South Segoe Road, Madison, Wisconsin 53711. 1968. \$5.00 paperbound & \$6.00 clothbound.

What a gem for the agriculture student and all biology teachers of all levels who so much as touch on the topic of genetics! Dramatically clear, good size color prints illustrate very effectively the mutant appearances.

The book includes a convincing photograph and schematic drawing of *Zea mays* L. chromosomes, a cytological map of the ten chromosomes, a linkage map. those wonderful color plates of mapped mutants arranged by chromosome numbers, of chromosomal abnormalities, of mutator systems, and of non-Mendelian paramutations R & B, interaction tables of anthocyanin pigments in aleurone and other tissues and of chlorophyll dormancies, a full index of the genes, and references.

In the foreword the president of the Crop Science Society of America states: "These up-to-date color illustrations of the mutants should be helpful to researchers around the world in recognition and classification of the mutant characters. It is also anticipated that the availability of these fine illustrations will acquaint instructors of botany and biology in colleges and high schools with the potential use of maize mutants for laboratory classes. Finally, it is hoped that these illustrations may serve to interest and motivate students into the fields of genetics and plant improvement." Exposure to this book should surely metamorphose these intentions into facts.

"THE POCKET ENCYCLOPAEDIA OF PLANT GALLS IN COLOUR" by Arnold Darlington, 191 pp., illus., Philosophical Library, Inc., New York City, New York 10016. 1968. \$7.50.

This pocket-sized book is indeed a gem without competitors because of its excellent text and almost 300 beautifully clear color photographs and paintings very well reproduced in the printing process. There are many effective black and white drawings and diagrams also. The text consists of (1) an introduction with an annotated bibliography, (2) descriptions of the causes and varieties of these cecidia which are derived wholly from the plant tissues but instigated by such cecidophytes as bacteria, fungi, nematodes, mites and various insects, (3) ecological notes on the interrelationships among gall occupants, (4) directions for field study and (5) notes on representative British galls arranged in Clapham, Tutin and Warburg's systematic order.

There is no key, but the very common practice of flipping through the illustrations and/or recognizing the plant host will lead to gall identifications. Since so many of the host plants and their galls have been introduced into the United States, this book will prove very useful in this country too.

Studies in the Equitant *Oncidiums* IV.

W. W. G. Moir

Due to some unforeseen circumstances, as well as to some oversights, a number of corrections and additional information are offered here as a supplement to various Orchid taxa published by the author in *Phytologia* vol. 15: 06 - 12, June 1, 1967 and vol. 17: 425-434, December 6, 1968.

Volume 15: 6 - 12, June 1, 1967

At the time when the manuscript describing the various orchid taxa was sent to press, it was stated that the types are deposited in the Bishop Museum Herbarium. Unfortunately, due to circumstances beyond my control, the specimens became moldy and disintegrated. Since each new taxon was described from a living specimen, it is possible to prepare new type materials from them. Such new types of the following taxa are now deposited in the Orchid Herbarium of Oakes Ames, Harvard University.

- Oncidium* x *floride-phillipsae*, Moir & Hawkes,
" *Hawkesianum*, Moir
" x *jamaicense*, Moir & Hawkes
" x *sanctae-anae*, Moir & Hawkes
" x *Withnerianum*, Moir & Hawkes
" *leiboldii* Rchb. f. var. *majus* Moir & Hawkes

Volume 17: 425-434, December 6, 1968

By oversight, after the descriptions, a statement has been omitted regarding the place where the actual type material is deposited. Since this statement is a prerequisite for valid publication, the following amendment is offered:

Oncidium scandens Moir, in *Phytologia* 17: 426, 1968, et in hoc loco
Syn.: *O. kenscoffii* Hort.

Haiti: 6,000 ft. in pine forests above Kenscoff. Type (AMES)
Type cultivated by W. W. G. Moir, Honolulu.

The references to *Onc. kenscoffii* (Hort.) first appeared in Pacific Orchid Society Bulletin Vol. 16 No. 2, 1958 with first picture; then in the same publication Vol. 17 No. 3 Dec. 1959; in *Ma Pua Okika O Hawaii Nei* Vol. 13 No. 2 Apr. 1962 pages 34-38; in *Florida Orchidist* Vol. 5 No. 5 May-June 1962 page 142; and in various issues of *Ma Pua Okika O Hawaii Nei* in articles on Lipolani and in various Orchid Show Programs. Since Kenscoff is the name of a small town, therefore the name should have been *kenscoffense* and, since the plant was collected many miles away, it was decided to use a more descriptive name - *Onc. scandens*. No species in any collection can compare with it in the mass of flower spikes and its excessive mass of erect scandent growths.

Oncidium caymanense Moir in Phytologia 17: 424, 1968, et in hoc loco

Cayman Islands: Grand Cayman, without proper locality. Type! (AMES). Type cultivated by W. W. G. Moir, Honolulu.

Onc. caymanense in my garden put on a new growth double the size with spike 5 times longer and up to 15 flowers on the main stem, plus several side branches starting. This growth is used as the type specimen. The flowers are peculiar in that the labellum is set back under the crest instead of on the same plane as in Onc. variegatum. It is a plant with compact growth, that has no long rhizomes and the crest is very thick in its parts and very much resembling Onc. leiboldii but flowering in early summer instead of early fall. Leaves do not have the very narrow slim leaves at the base as in leiboldii.

Oncidium cuneilabium Moir in Phytologia 17: 431, 1968, et in hoc loco

Jamaica: without proper locality. Type! (AMES). Type was cultivated by W. W. G. Moir, Honolulu.

Since this species was originally proposed, the plant has died. Therefore, photographs of the original type plant is deposited in the Ames Herbarium in lieu of a specimen.

Oncidium apiculatum Moir in Phytologia 17: 432, 1968 et in hoc loco

Jamaica: without proper locality. Type! (AMES) Type plant was cultivated by W. W. G. Moir, Honolulu.

Since the original plant of this species is no more in existence, photographs of it are deposited in the Ames Herbarium in lieu of a specimen.

Oncidium concavum Moir in Phytologia 17: 432, 1968 et in hoc loco

Jamaica: St. Ann Parish, near Claremont. Coll. G. Hart s.n. Type! (AMES) Type plant was cultivated by W. W. G. Moir, Honolulu.

The type plant has died since this species was described. Therefore photograph of the original plant has been deposited in the Ames Herbarium in lieu of a specimen.

STUDIES IN THE EQUITANT ONCIDIUMS V.

During the course of my studies in equitant oncidiums, two additional hybrids appear to be as yet undescribed. Their putative parentage has been verified through artificial hybridization. The resulting progeny of these artificial crosses matches closely the details of wild-collected specimens.

ONCIDIUM x FURCYENSE Moir, hybr. no. nat.

(O. variegatum Sw. x O. scandens, Moir)

Habitus inter parentes intermedium. Pseudobulbi nulli. Folia 8 - 10 sessilis, lancolata, acuta, denticulata, stricta, coriacea, ad 7 - 9 cm longa, 1.3 cm. lata, plus minus falcata et conduplicata. Aerius radices magno numero. Inflorescentia 30 - 40 cm longa, flores racemosae 10 - 30; bracteae lineares, acutae 1 cm. longae, 3 mm latae. Sepalum dorsale erectum 1.3 cm longum, 4 mm latum, brunneo-roseum, acutum, sepala lateralia sensynsepalum 1.3 cm longum, 4 mm latum, parvi apice bidentatum. Petala panduriformis, brunnea ad rosea ultima parvem, 1.7 cm longa, 7 mm lata, margine undulata, denticulata, apice reflexa. Labellum 1.8 cm longum, 2.5 cm latum, lobi laterales 6 mm longi 4 mm lati, flexum sursum, roseum; isthmus 7 mm ad 4 mm latus, 1 cm longus, roseus cum maculis aurantiacis. Lobi inferior reniformis, largo; cristis flavus 5 lobi; gymnostemii alae acinaciformis, purpureum.

Plant growth intermediate to that of parents, rhizomes shorter. Pseudobulbs absent. Leaves 8 - 10 in number, lanceolate, sharp pointed and coarsely denticulated, 7 - 9 cm long 1.3 mm. broad not as slender as Onc. scandens. Aerial roots numerous. Flower spike 30 - 40 cm long with flowers racemose 10 to 30 in number, bright strong pink, bracts triangular apiculate 1 cm x 3 mm. Dorsal sepal erect 1.3 cm x 4 mm, brownish pink apiculate; lateral sepals in synsepalum 1.3 cm x 4 mm with very small points. Petals panduriform, brown then pink 1.7 x 7 mm margin undulated and denticulate with point reflexed. Labellum 1.8 cm x 2.5 cm, lateral lobes 6 mm long by 4 mm broad, curving upwards toward column; isthmus tapering from 7 mm to 4 mm, pale pink with orange dots; lower lobes full but reniform in shape, with large indent separating them at bottom, crest's lobes deep yellow, midway between parents with only slight groove in upper lobes which are not so dipped down as in variegatum. Wings on column scimitar-shaped and deep purple. This is a very vigorous grower with excellent sprays of stiffer and fuller flowers than parents.

Haiti at 5000 ft. directly above small village of Furcy in the pines south of both Kenscoff and Port au Prince by several miles. Collected growing in tall grass in open areas in the forest of pines.

Type specimen at Oakes Ames Herbarium. Original plant collected March 15, 1955. Specimen prepared from plant growing in Moir's garden, Honolulu, Hawaii.

ONCIDIUM x *DOMINGENSE* Moir n.h. nov.

(*O. haitiense* Leonard & Ames x *O. scandens* Moir)

Habitus inter parentes intermedium, rhizoma alte scandens, rhizoma ad 6 cm. Planta caespitosa, folia ad 16, sessilis, falcata, acuta, toto margine cartilagina dentata, 3 - 11 cm longa, 3 mm lata, supra sulcata. Inflorescentia ad 70 cm, semirecta, flores in racemose, multiflorus; bracteae triangulae, lanceolatae, acuminata, 1 cm long, 3 mm lata, stictus; pedicel 2 cm; flores diffusum laxana multiflorum dispositi, stramineus. Sepalum dorsale 6 mm longa, 2 mm lata, apice reflexum, concavum, oblongum, subspathulatum, maculosus badius; lateralia 8 mm longa 4 mm lata, concavum, apicule luteus, parvi, maculosus badius. Petala panduriformis 9 mm long, 5 mm lata, apice reflexum, stramineus, radices maculosus badius. Labellum 1.8 cm longa, 1. cm lata, lobi laterales 4 mm longa 3 mm lata, obtusa; isthmus semitubulatus 5 mm longa, 5 mm lata, stramineus, maculosus badius, margin denticulata; cristis tuberculis 6, tuberculis 3 alta magnus, cum medium magnus reclusum sursum, porro, lateralis tuberculi parvi; inferior lobi remiformis, largo, margino denticulate, pars reflexa semitubulata, stramineus.

Plants with scandent rhizomes to 6 cm. Leaves to 16 in number, sessil, falcate and acute, margin of cartilaginous sharp teeth, 3 - 11 cm long, 3 mm broad, falcate above middle. Inflorescence to 70 cm; semirect, flowers in raceme, many; bracts triangular, lanceolate, acuminate, 1 cm long 3 mm broad, tightly held; petiole 2 cm; flowers scattered along stem, straw colored. Dorsal sepal 6 mm long, 2 mm broad, tip reflexed, sepal concave and oblong, subspathulate covered with chestnut brown small spots; lateral sepals 8 mm long, 4 mm broad joined together, concave spotted same colors with small straw colored tips. Petals fiddle-shaped 9 mm long 5 mm broad, point reflexed, straw colored with inner 1/3 spotted in chestnut brown. Lip 1.8 cm long, 1.5 cm broad; upper lobes 4 mm by 3 mm broad, turning upwards; isthmus semi-tubular 5 mm long, 5 mm broad, straw colored with many chestnut brown colored spots, margin toothed; crest tuberculi 6 in all, 3 upper ones, with center very small, 3 lower ones with the middle one very large turned upwards and inward, lateral 2 tuberculi small and turning sidewise; lower lobe kidney shaped with wavy toothed edge the sides reflexed to give skirted and tubular effect, all straw colored.

Dominican Republic, west of Loma de Cabrera. Type specimen at Ames Herbarium. Original plant sent to me by someone without giving his name. Specimen prepared from plant growing in Moir's garden, Honolulu, Hawaii.

These two natural hybrids complete the collected natural hybrids grown for several years while hybrids were made between species I felt were their parents. The result being a confirmation and hence the descriptions are recorded above. Hybridization is an important part of knowing the material one works with or finds.

NOTICE

Otto & Isa Degener

address: Waialua, Oahu, Hawaii 96791

The following notice appeared in *Torreya* 33: 158, December 27, 1933:

AN OPPORTUNITY TO COOPERATE IN THE STUDY OF HAWAIIAN PLANTS!

Because of the unique geographical position of the Hawaiian Islands, the writer ten years ago realized that the existence of a complete, illustrated Hawaiian flora would be of considerable scientific interest and value. As no work of this kind has ever been written—few people are aware that vast areas on many of the larger islands are even now botanically almost unknown—he resolved to attempt this task himself. Meeting with some local opposition and relieved of all teaching duties, he has been able to concentrate since 1927 on the collecting and studying of Hawaiian Vascular Plants. The resulting herbarium, now stored at the New York Botanical Garden, comprises about 40,000 specimens. The writer wishes to communicate with botanists who are interested in some of the Hawaiian genera represented and who may desire to aid in their study. The result of such studies would be finally embodied in the "*Flora Hawaiiensis*" or "New Illustrated Flora of the Hawaiian Islands." Address Otto Degener, Care New York Botanical Garden, Bronx Park, New York.

The writers wish to revise the above notice by inviting collaborators to publish jointly in loose-leaf format select Pteridophytes and Phanerogams in their Flora Hawaiiensis, and other groups of plants in their Flora Hawaiiiana.

PHYTOLOGIA

Designed to expedite botanical publication

Vol. 19

October, 1969

No. 2

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T

QUERCUS SHUMARDII VAR. STENOCARPA LAUGHLIN
STENOCARP SHUMARD OAK

Varietas nova

Kendall Laughlin (1890-)
165 Pine Ave., Chicago, Ill.

Haec varietas a forma typica speciei glandibus distat.

Glandes plerumque 24-26 cm longae; cupula leviter scutelliformis, 5.5-7 mm alta, 12.5-18 mm lata, intus glabra, tecta pallidis cinereo-brunneis artedpressis lanceolatis vel triangulis glabris squamis; nux pallida rufo-brunnea, pallido cinereo tomentulo varia, oblonga, in apice rotunda et in summa cupula leviter angustata, 20-22 mm longa, (11.5-)14-16 mm lata, 1/10-2/9 conclusa in cupula; pedunculus 8 mm tenus longus.

Holotypus: US.

Bark, winter buds and leaves as in the species.

Acorns usually 24-26 mm long; cup shallowly saucer-shaped, 5.5-7 mm high, 12.5-18 mm wide, glabrous inside, covered with light grayish brown closely appressed lanceolate or deltoid glabrous scales; nut pale reddish brown, mottled with light gray tomentulum, oblong, rounded at the apex and slightly narrowed at the top of the cup, 20-22 mm long, (11.5-)14-16 mm wide, one-tenth to two-ninths enclosed in the cup; peduncle up to 8 mm long.

DISCUSSION

I first encountered this taxon 25 Sep.1944, when Professor A. E. Shirling of the Junior College of Kansas City, Mo. showed me material in their herbarium from a tree in Swope Park. The tree had been found by B. F. Bush and the material was labeled "Quercus leioclada," which was never described.

Professor Shirling told me where the tree was. I found it, growing below a ledge of the Bethany Falls limestone about 150 feet east of the asphalt path that connected the upper and lower levels of No. 2 Golf Course, overlooking the valley of Cave Spring Branch. It was 2 feet 5 inches in circumference in 1968. I call this tree #2. Leaves and acorns from it are illustrated herein.

On a visit 25 Oct.1960 to Beall Woods, in the high bottom of the Wabash River 4½ miles southwest of

Mt. Carmel, Ill., I found that the biggest tree, in the southeast corner of the woods, had acorns identically similar to the tree in Swope Park. I measured and photographed this tree in October 1965. It had a circumference of 15 feet 11 inches, a height of 131 feet and a spread of 98 feet. It is the largest Shumard Oak in the Midwest. I am making this tree the type tree of stenocarpa and I call it #1.

The distinctive character of stenocarpa is its acorns, which have very narrow and shallow cups and very narrow nuts. On the average the cups of shumardii are heavier than rubra L., the Northern Red Oak, but since the cups of stenocarpa are even shorter than typical rubra, the tree described as stenocarpa has been regarded by some taxonomists as a form of rubra and by others as a distinct species. It might be embarrassing to tell how many times stenocarpa has been misidentified as rubra.

The undersurface of the leaves of stenocarpa have rusty hairs in the axils of the veins, which are characteristic of shumardii and not rubra.

It may be noted from the illustrations that there is considerable difference between the leaves of #1 and #2. The former are typical shumardii. The fact that the largest lobe of the leaves of #2 is scarcely broadened toward the apex and the primary veins meet the midrib at a smaller angle suggests the possibility of introgression into rubra.

Whether leaves collected from a tree are or may be rubra may be determined by the following rule:

If the ratio of the distance measured along the upper edge of the principal lateral lobe from the bottom of the sinus above it to the tip of the lobe to the distance across the central portion of the blade from this sinus to the nearest sinus on the opposite side is more than 1.4, the tree is not Quercus rubra.

This ratio in all collections of stenocarpa is more than 1.4.

The hybrid of rubra and shumardii (schneckii), Xriparia, was described by me in PHYTOLOGIA 9:101 from a tree on the bank of the Blue River in Swope Park. Since then two other trees of this hybrid have been found, all growing on the riverbank. These leaves have a short, broad terminal lobe, as illustrated on page 107, Vol. 9, unlike either parent and more like Q. kelloggii Newb. The leaves of stenocarpa are shaped differently and the acorns are very different.

Gray's Manual and Steyermark's "Flora of Missouri" state that the acorn-cup of shumardii is 2-3 cm wide. Since the acorn-cup of stenocarpa is only 12.5-18 mm wide, it must be something different. While the

acorns of schneckii are described as being smaller, its deep cups would not fit stenocarpa.

Mr. Louis M. Bottenberg of Kansas City has sent me acorns from a tree in Columbia, Mo. which fit the description of stenocarpa.

All three of the above localities are at or near the northern limit of the range of shumardii. Perhaps stenocarpa is confined to that zone.

The acorns of stenocarpa look more like texana, which grows in central Texas, than other varieties of shumardii. Study of specimens of texana in the herbarium of the Chicago Natural History Museum shows the following differences between texana and stenocarpa, based on averages. The leaf blades of texana are 4 cm shorter and have 1 less lobe; the largest lateral lobe is either narrow, or broad and roughly triangular without lobules, whereas this lobe of stenocarpa is pinnatifid with a lower lobule. The acorns of texana are 4.5 mm shorter; the cup is 3 mm wider; the nut of texana is ovoid, that of stenocarpa is oblong.

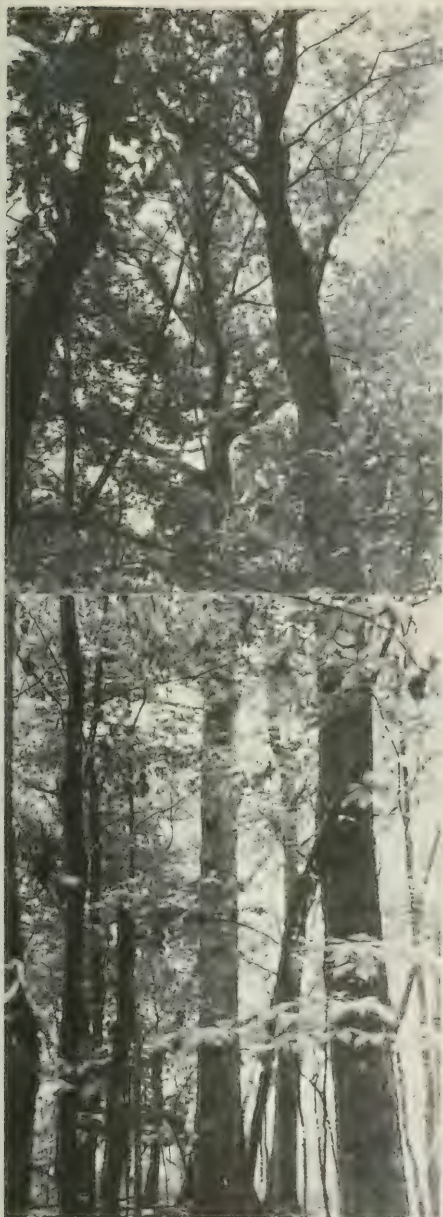
In his Key in "The Red Oak Complex in the United States" (Amer. Midland Nat. 27:739.1942.) Ernest J. Palmer placed trees with shallow acorn-cups less than 2 cm wide in the variety schneckii. Since the deep cups of schneckii are generally regarded as its distinctive character, it does not seem consistent to include shallow cups in this variety. The tree in Swope Park would fit Palmer's description above quoted; but nevertheless, this tree has been identified by different taxonomists under three different names, none of which was schneckii.

I have prepared the Key on the following page to clear up the taxonomy of the Northern varieties of shumardii. In using this Key, the figure shown in the "Weight" column should be put down in the appropriate column whose description matches the specimen's characters: the column with the largest total determines the identity of the specimen.

The holotype will be deposited in the United States National Museum, Washington, D.C.

KEY DISTINGUISHING VARIETIES OF QUERCUS SHUMARDII

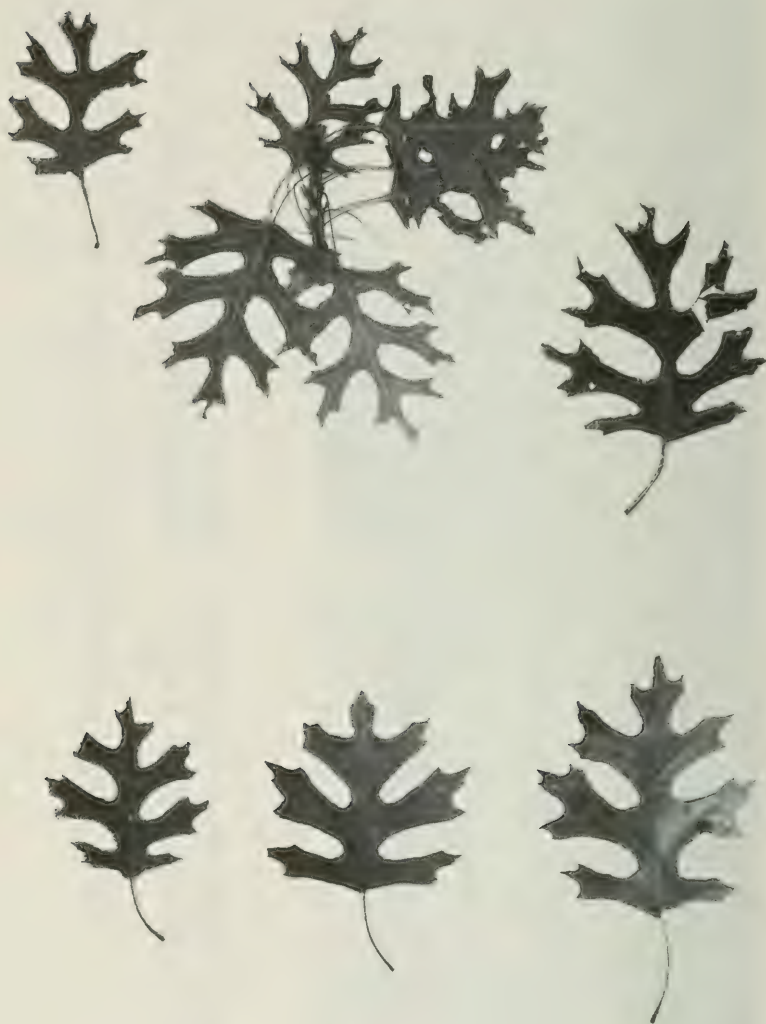
WEIGHT	CHARACTER	STENOCARPA	SHUMARDII	SCHNECKII
1	Leaf Blades	Typically and uniformly lobed thruout the tree.	Lower leaves shorter and less deeply lobed than upper leaves.	Typically and uniformly lobed thruout the tree.
1	Acorn: Cup: Scales	Smooth	Tuberculate	Smooth
3	Shape	Shallowly saucer-shaped, 5.5-7 mm high.	Saucer-shaped, 7-11 mm high.	Bowl-shaped or hemispheric, at least 10 mm high.
1	Coverage of Nut	One-tenth to two-ninths.	Two-ninths to one-third.	More than one-third.
1	Width mm	12.5-18	More than 21.	19-21
1	Width of Nut mm	(11.5-)14-16	16-21	16-21



THE TYPE TREE OF QUERCUS SHUMARDII STENOCARPA
Circumference 15 feet 11 inches Height 131 feet
#1

Beall Woods State Park, Illinois

10/19/65



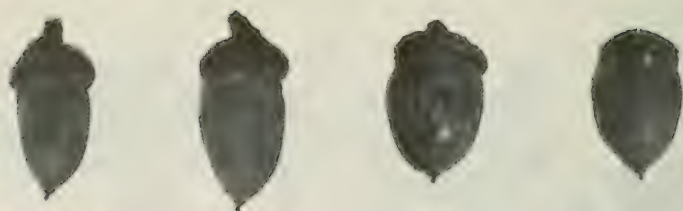
LEAVES OF QUERCUS SHUMARDII STENOCARPA #1

X $\frac{1}{4}$

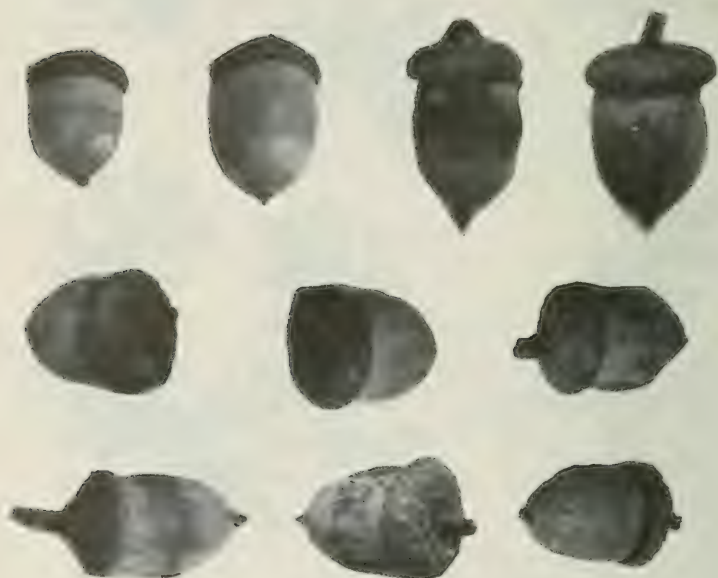


LEAVES OF QUERCUS SHUMARDII STENOCARPA #2

X $\frac{1}{4}$



FROM TREE #2
ACORNS OF QUERCUS SHUMARDII STENOCARPA
X 92%



FROM TREE # 1
ACORNS OF QUERCUS SHUMARDII STENOCARPA
X 92%

ADDITIONAL NOTES ON THE ERIOCAULACEAE. XXV

Harold N. Moldenke

ERIOCAULON ALATUM H. Lecomte

This taxon is now reduced to synonymy under E. zollingerianum Körn., which see.

ERIOCAULON ALPINUM Van Royen

Additional bibliography: Moldenke, Bull. Jard. Bot. Brux. 27: 130. 1957; Van Royen, Nov. Guin., new ser., 10: 24, [27], 39-40, & 44, fig. 1a. 1959; Moldenke, Phytologia 17: 453 (1968) and 19: 14. 1969.

Illustrations: Van Royen, Nov. Guin., new ser., 10: [27], fig. 1a. 1959.

Van Royen (1959) cites Brass 9226 from Lake Habbema, New Guinea, in the Rijksherbarium at Leiden, as the type of this endemic species. He also cites Brass & Meyer Drees 9956 from the same island and says that the species inhabits "marshy slopes at high altitudes". He further remarks that "Originally the specimens mentioned above have been identified by H. Moldenke as E. brevipedunculatum Merrill, but this is certainly an error since in that species the receptaculum bears long white hairs and the sepals of either type of flower are greenish or yellowish, while in E. alpinum the receptaculum is glabrous and the sepals are blackish. Moreover the sepals of the female flowers are free in E. brevipedunculatum and in the present species they are tubuliformly united with the two lateral sepals free from each other. The petals in the male flowers are acute and almost equal, while in E. brevipedunculatum they are obtuse and distinctly unequal. Also, the petals of the female flowers are glabrous at the inside while those of the Philippine species have long white hairs there. Finally the leaves have more than 10 nerves, those of E. brevipedunculatum 6 to 9 and the involucrel bracts are glabrous in the present species while in the other they have white hairs at the apex. The present species shows a clear resemblance to E. montanum Van Royen but differs from that species by the many nerves of the leaves and by the black sepals of either type of flowers and the united sepals of the female flowers."

Citations: MELANESIA: NEW GUINEA: Dutch New Guinea: Brass 9226 (N-isotype); Brass & Meyer-Drees 9956 (N); Hoogland & Schodde 7031 (W-2393235). Northeastern New Guinea: M. S. Clemens 5584 (N), 7409 (B, N), 9368 (N), 9942 (B, N).

ERIOCAULON AMBOENSE Schinz

Additional bibliography: Moldenke, Phytologia 19: 15 & 46. 1969.

According to a letter from Dr. A. Schreiber, dated July 31,

1969, Dr. Roeszler feels that Bleissner 90 and Gies, Volk, & Bleissner 5862 in the Munich herbarium are actually young or undeveloped specimens of E. amboense. In deference, therefore, to the opinion of this noted expert on the southwest African flora, I will tentatively concur in this determination, although the specimens in question certainly do not resemble very much any other material of this species which I have thus far seen.

Additional citations: SOUTHWEST AFRICA: Gies, Volk, & Bleissner 5862 (2).

ERIOCAULON ARFAKENSE Van Royen

Bibliography: Van Royen, Nov. Guin., new ser., 10: 23, 26—28, & 44, fig. 1b. 1959.

Illustrations: Van Royen, Nov. Guin., new ser., 10: [27], fig. 1b. 1959.

The type of this species is Anta 222 from Tamurik Camp, in the Manokwari District, western New Guinea, deposited in the Rijks-herbarium at Leiden. Van Royen (1959) states that the species grows among grasses in swamps at low altitudes and is endemic to New Guinea. He notes further that "This species differs from all species in Eriocaulon by the absence of sepals in both types of flowers and by the two stamens. The absence of sepals in the male flowers this species has in common with E. heterogynum F. Muell., but it differs from that species by the two stamens. The absence of sepals in the female flowers this present species has in common with no other species in Eriocaulon. The specific epithet is derived from the Arfak Mountains, the area in which this species is collected for the first time."

ERIOCAULON ARUPENSE Van Royen

Bibliography: Van Royen, Nov. Guin., new ser., 10: 23, [27], 33—34, & 44, fig. 1c. 1959.

Illustrations: Van Royen, Nov. Guin., new ser., 10: [27], fig. 1c. 1959.

This species is based on "MBW 3067" from Wissel Lakes, altitude 1750 meters, in west-central New Guinea, deposited in the Rijksherbarium at Leiden. Van Royen (1959) states that the species is endemic to New Guinea, inhabiting swamps at high altitudes, and bears the vernacular name "dariwoerie". He remarks that it is "Closely related to E. leucogenes Ridley but differing by the much longer leaves, peduncles and sheathes, and by the dark central patch of the floral bracts. The specific epithet is derived from the name of the area Arupa, in which the species has been collected for the first time."

ERIOCAULON AUSTRALE R. Br.

Additional bibliography: Van Royen, Nov. Guin., new ser., 10: 23, [27]—29, & 44, fig. 1d. 1959; Moldenke, Phytologia 19: 18—19. 1969.

Additional illustrations: Van Royen, Nov. Guin., new ser., 10:

[27], fig. 1d. 1959.

Van Royen (1959) states that this species is found "In periodically flooded grassy plains and meadows, and in Melaleuca swamps. Usually on sandy ill-drained soils of areas at low altitudes" in New Guinea, where it is known as "baha baha". He cites from Dutch New Guinea: Anto 208, Branderhorst 92, "NGEW" 2861, and Van Royen 4871 & 4872, from Northeastern New Guinea: Womersley NGF 9344 & 9353, and from Papua: Brass 5751 & 5752.

ERIOCAULON BATAVORUM Van Royen

This name belongs in the synonymy of E. oreadam Van Royen, which see.

ERIOCAULON BRACHYPEPLON Körn.

Additional bibliography: Van Royen, Nov. Guin., new ser., 10: 23, [27], 29, & 44, fig. 1f. 1959; Moldenke, Phytologia 19: 20. 1969.

Illustrations: Van Royen, Nov. Guin., new ser., 10: [27], fig. 1f. 1959.

Van Royen (1959) affirms that the type and only known collection of this species is deposited in the herbarium of the Botanischer Museum at Berlin.

ERIOCAULON BREVIPEDUNCULATUM Merr.

Additional bibliography: Van Royen, Nov. Guin., new ser., 10: 35, 37, 39, 40, & 44. 1959; Moldenke, Phytologia 19: 20--21 & 23. 1969.

ERIOCAULON CINEREUM R. Br.

Additional bibliography: Van Royen, Nov. Guin., new ser., 10: 22, 23, 25--26, 30, & 44, fig. 2g. 1959; Moldenke, Phytologia 19: 25--26 & 38. 1969.

Additional illustrations: Van Royen, Nov. Guin., new ser., 10: 30, fig. 2g. 1959.

Van Royen (1959) gives the overall distribution of this species as "Central Africa, South Africa, India, Ceylon, Japan and China to Northern Australia" and notes "Not yet known from New Guinea, but since in the surrounding islands it is found in Java, Madura, the Philippines and Northern Australia this species is likely to be met there in the future."

ERIOCAULON DEPRESSUM R. Br.

Additional bibliography: Körn., Linnaea 27: 587. 1856; F. Muell., Census, ed. 2, 207. 1889; F. M. Bailey, Queensl. Fl. 6: 1717. 1902; F. M. Bailey, Compreh. Cat. Queensl. Fl. 584. 1913; Ewart & Cookson in Ewart & Davies, Fl. N. Terr. 67. 1917; Van Royen, Nov. Guin., new ser., 10: 24 & 44. 1959; Moldenke, Phytologia 19: 34. 1969.

Van Royen (1959) cites Körnicke's work as "1854", but the part concerned here was not issued until 1856.

ERIOCAULON GIBBOSUM var. *LONGIFOLIUM* Körn.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 489—490. 1863; Moldenke, Phytologia 18: 93—94. 1969.

In my previous publications I regarded this variety as invalid, but on examining more material I am now not so sure. Possibly it is worth maintaining. It was based by Körnicke (1863) on five specimens: G. Gardner 4383 from Minas Gerais, Lund s.n. [in ripa rivuli Uberava, Julio] from Minas Gerais, L. Riedel 2416 from Goiás, Vauthier s.n. [in Brasilia orientali], and Weddell 2128 from Goiás, Brazil. He describes it as "foliis longioribus, 9—15-nerviis, 10—27 lin. longis, medio 1—1 3/4 lin. latis". The Munich sheet of L. Riedel 2416, however, has only short leaves, so this collection number may represent a mixture. Another possibility is that larger leaves may have been lost from the Munich plant before it was collected (or mounted). More study is needed before it can be determined definitely if Körnicke's variety is a valid one. Luetzelburg gathered it on dry granite.

Citations: BRAZIL: Bahia: Luetzelburg 659a (Mu). Goiás: Weddell 2128 [4] (Br—cotype, N—cotype, N—photo of cotype, Z—photo of cotype).

ERIOCAULON HETEROGYNUM F. Muell.

Additional bibliography: Van Royen, Nov. Guin., new ser., 10: 23—25, 30, & 44, fig. 2h. 1959; Moldenke, Phytologia 19: 45—46. 1969.

Illustrations: Van Royen, Nov. Guin., new ser., 10: 30, fig. 2h. 1959.

Van Royen (1959) cites Van Royen 4873 from Dutch New Guinea, where, he says, the species grows on grassy plains in periodically flooded savannas at low altitudes. He gives "Eriocaulon depressum R. BR. in SMITH in REES Encycl. 13 (1809)" as a synonym of E. heterogynum. He dates Mueller's work as "1858", but the part concerned here was actually not published until 1859.

ERIOCAULON HEUDELII N. E. Br.

Additional bibliography: Moldenke, Phytologia 19: 15 & 46. 1969.

Additional citations: ZAMBIA: E. A. Robinson 3471 (Mu). SOUTH-WEST AFRICA: Baum 111 (Mu—376, Z); Giess & Leipert 7603 (Mu).

ERIOCAULON HILDEBRANDTII Körn.

Additional bibliography: Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 18: 181. 1969.

Additional citations: MADAGASCAR: Hildebrandt 3598 (Mu—iso-type).

ERIOCAULON HONDOENSE Satake

Additional & emended bibliography: Moldenke, Phytologia 18: 181—185, 310, 311, & 441. 1969.

The Furuse s.n. [Sara-mma, 6 Oct. 1955], distributed as E.

hondoense, is actually E. miquelianum Körn.

Additional & emended citations: WESTERN PACIFIC ISLANDS: JAPAN: Hokkaido: Maximowicz s.n. [Hakodate, 1861] (B, Br, S). Honshu: Furuse s.n. [22 Sept. 1957] (Ac); C. Hashimoto 399 (Se—147243); Ohwi & Koyama 1124 (Se—167546); Togasi 722 (Ca—22981, Mg, M1, S, Se—161451, V1), 914 (B, Mg, S, Se—159496), 1101 (Mg, S, Se—164166).

ERIOCAULON HOOKERIANUM Stapf

Additional synonymy: Eriocaulon hookerianum var. hookerianum Van Royen, Nov. Guin., new ser., 10: 29—31, fig. 21. 1959.

Additional & emended bibliography: H. Lecomte, Journ. de Bot. 21: 89, 91, & [101]. 1908; H. Lecomte, Fl. Gén. Indo-Chine 7: 2 & 10—11. 1912; H. N. Ridl., Journ. Fed. Malay States Mus. 6: 191 & 192. 1915; H. N. Ridl., Fl. Mal. Penins. 5: 135, fig. 218. 1925; Van Royen, Nov. Guin., new ser., 10: 23, 29—31, 33, & 44. 1959; Van Royen, Blumea 10: 128 & 134. 1960; Moldenke, Phytologia 18: 185—187 & 303. 1969.

Illustrations: H. N. Ridl., Fl. Mal. Penins. 5: 135, fig. 218. 1925; Van Royen, Nov. Guin., new ser., 10: 30, fig. 21. 1959.

Ramaswamy found this plant growing in marshy areas near paddy fields and says "Heads numerous, black and have a large number of female flowers. The associated plants were (a) Utricularia, (b) Drosera, etc. Streiman & Kairo describe it as a small erect herb, 1 foot tall, with dull-green leaves and white flowers, growing at 5000 feet altitude in wet areas with Cyperaceae and Xyris, flowering and fruiting in April. The Clemenses found it flowering and fruiting in January.

The name, E. beccarii Ruhl., was apparently based on Beccari 2420 in the Berlin herbarium, one of the collections which was made a cotype of E. beccarii Suesseng. & Heine later on, along with Clemens & Clemens 27813 & 32629.

Van Royen (1959) cites Kostermans 2343 from Dutch New Guinea, where, he says, the species inhabits swamps along sides of lakes at high altitudes. He gives its overall distribution as "Malay Peninsula, Borneo, New Guinea."

Additional citations: INDIA: Mysore: Ramaswamy 2 (Rf). INDO-NEZIA: GREATER SUNDA ISLANDS: Borneo: Beccari 2420 (Mu—354). Sabah: Clemens & Clemens 27813 (Mu), 32629 (Mu). MELANESIA: NEW GUINEA: Northeastern New Guinea: Streimann & Kairo NGF.35677 (Mu).

ERIOCAULON HOOKERIANUM var. MICROPHYLLUM Van Royen

Bibliography: Van Royen, Nov. Guin., new ser., 10: 23, 30, 33, & 44, fig. 2j. 1959.

Illustrations: Van Royen, Nov. Guin., new ser., 10: 30, fig. 2j. 1959.

The type of this variety is Kostermans 2127 from Angi Gita Lake, at 1900 meters altitude, in the Arfak Mountains of western

New Guinea, deposited in the Rijksherbarium at Leiden. Van Royen (1959) describes the variety as differing from the typical form of the species "in the much smaller, obtuse leaves, 8—12 (—35) by 1—2.5 mm, the shorter peduncles, 1.5—11 (—16) cm., the smaller heads, the almost glabrous receptaculum and the smaller sizes of all organs. In the male flowers the petals sometimes have no glands or only some of them are absent." He regards it as endemic to New Guinea and says that it grows "in heath vegetation or in swamps, at high altitudes". He cites also Eyna 4798 and Gjellerup 1126 from Dutch New Guinea, and Robbins 173 & 261 from Northeastern New Guinea.

ERIOCAULON HUMBOLDTII Kunth

Emended synonymy: Eriocaulon decangulare Willd. ex Kunth, Enum. Pl. 3: 544, in syn. 1841 [not E. decangulare Hill, 1799, nor Hope, 1770, nor Huds., 1959, nor Hull, 1841, nor L., 1753, nor Lightf., 1777, nor Michx., 1959, nor Walt., 1788].

Additional & emended bibliography: C. Müll. in Walp., Ann. 5: 931 (1860) and 6: 1171. 1861; Aristeguieta, Act. Bot. Venez. 3: 25, 36, & 37. 1968; J. A. Steyerma., Act. Bot. Venez. 3: 96. 1968; Moldenke, Phytologia 18: 187—189 & 269. 1969.

Pursell, Curry, & Kremer found this plant growing "in standing water" in Venezuela.

Additional citations: VENEZUELA: Bolívar: Wurdack & Monachino 39962 (Mu), 41173 (Se—166856). Monagas: Pursell, Curry, & Kremer 8310 (N).

ERIOCAULON INTERMEDIUM Körn.

Emended synonymy: Eriocaulon setaceum Kunth apud C. Müll. in Walp., Ann. 5: 931, in syn. 1860 [not E. setaceum Auct. ex Backer & Bakh., 1968, nor Benth., 1893, nor Crantz, 1893, nor Heyne, 1832, nor L., 1753, nor Lour., 1790, nor Rottl., 1960, nor Wall., 1893, nor Wight, 1832, nor Willd., 1959]. Eriocaulon setaceum Hook. f. ex Moldenke, Résumé 292, in syn. 1959.

Additional & emended bibliography: C. Müll. in Walp., Ann. 5: 925 & 931 (1860) and 6: 1171. 1861; H. Lecomte, Journ. de Bot. 21: 89 & 90. 1908; H. Lecomte, Fl. Gén. Indo-Chine 7: 2 & 4—5. 1912; Moldenke, Phytologia 18: 243—244, 280, 429, & 433 (1969) and 19: 38. 1969.

Lecomte (1912) differentiates this species from the very similar E. setaceum L. as follows: "capitules glabres — E. intermedium; capitules blancs, velus — E. setaceum".

The Clemens & Clemens 4214, distributed as E. intermedium, is actually E. setaceum L.

Additional citations: INDIA: Travancore: R. Wight 2369, in part (C).

ERIOCAULON INTRUSUM Meikle

Additional bibliography: Moldenke, Phytologia 18: 244—245. 1969; Anon., Assoc. Stud. Tax. Fl. Afr. Trop. Index 1968: 24.

1969.

ERIOCAULON IRREGULARE Meikle

Additional bibliography: Moldenke, *Phytologia* 18: 245 & 393. 1969; Anon., *Assoc. Etud. Tax. Fl. Afr. Trop. Index* 1968: 25. 1969.

ERIOCAULON JAPONICUM Körn.

Additional bibliography: Iinouma, *Somoku Dzusetsu*, ed. 2, 17: pl. 49. 1874; Stapf, *Ind. Lond.* 3: 90. 1930; Moldenke, *Phytologia* 18: 246. 1969.

Illustrations: Iinouma, *Somoku Dzusetsu*, ed. 2, 17: pl. 49. 1874.

ERIOCAULON JORDANI (Moldenke) Meikle

Additional bibliography: Moldenke, *Phytologia* 18: 247. 1969; Anon., *Assoc. Etud. Tax. Fl. Afr. Trop. Index* 1968: 25. 1969.

ERIOCAULON KINABALUENSE Van Royen

Synonymy: Eriocaulon brevipedunculatum Suesseng. & Heine apud Van Royen, *Blumea* 10: 133, in syn. 1933 [not E. brevipedunculatum Merr., 1907].

Additional & emended bibliography: E. D. Merr., *Bibl. Enum. Born. Pl.* 110. 1921; Moldenke, *Bull. Jard. Bot. Brux.* 27: 130. 1957; Van Royen, *Blumea* 10: 128, 129, & 133--134, fig. 1F. 1960; D. N. F. Kiehl, *Blumea* 10: 657. 1960; Moldenke, *Phytologia* 17: 453 (1968), 18: 248 (1969), and 19: 21. 1969.

Illustrations: Van Royen, *Blumea* 10: 129, fig. 1F. 1960.

The type of this species was collected by the late Mary Knapp Clemens (no. 10611) on the way from Paka Cave to Low's Peak, Mount Kinabalu, Sabah, on November 13, 1915. Van Royen (1960) cites also Clemens & Clemens 27089, 27777, 32336, & 51120. In the past this species was confused with the Philippine E. brevipedunculatum Merr. by Merrill himself and, later, by Suessenguth & Heine and by me. The two taxa are certainly very closely related and are very similar in general habit. Van Royen says of his species "In habit closely related to E. brevipedunculatum Merr., but differing from that species by the pubescent involucre bracts, the long white hairs on the stem and on the inside of the male flowers". Suessenguth & Heine, however, have a special notation on the Munich sheet of Clemens & Clemens 27089 saying "Brakteen kah!"

The species has been collected at 11,000 to 13,000 feet altitude, growing in mats on a granite dome, in shelter of the boulders below ice sheets, the inflorescence described as gray or brown when fresh, flowering and fruiting in January, May, June, and November. The Haslam s.n. cited by Merrill (1921) is probably also this species

Citations: INDONESIA: GREATER SUNDA ISLANDS: Sabah: M. K. Clemens 10504 (Ca--214441), 10611 (Ca--214439--isotype, Z--iso-

type); Clemens & Clemens 27089 (N), 27777 (N), 27089 (Mu), 30059 (N), 32336 (Ca—541311, N), 51120 (Ca—557560).

ERIOCAULON KIUSIANUM Maxim.

Additional & emended bibliography: Maxim., Dec. Fl. Asiat. 8: 22. 1893; Mak., Bot. Mag. Tokyo 8: 506 & 507. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 158 (1902) and 501. 1906; Moldenke, Phytologia 18: 249. 1969.

The original Maximowicz publication (1893) of this taxon was incorrectly cited by Durand & Jackson (1902) to Bull. Acad. Sci. St.-Pétersb., as it was also by me in a previous installment (1969) of these notes. The evidence seems to be conclusive that this part of Maximowicz's work was only issued separately.

The Liang 66137, cited by me earlier in these notes, is a mixture with E. sinii Ruhl.

Additional citations: FORMOSA: Tanaka & Shimada 13574 (Mu).

ERIOCAULON KLOTZSCHII Moldenke

Additional & emended bibliography: C. Müll. in Walp., Ann. 5: 931 (1860) and 6: 1170. 1861; Moldenke, Phytologia 18: 249—250 & 376. 1969.

ERIOCAULON KLOTZSCHII var. PROLIFERUM (Moldenke) Moldenke

Additional bibliography: Moldenke, Phytologia 18: 250. 1969.

Additional citations: VENEZUELA: Amazonas: Maguire & Wurdack 34595 (Mu—isotype).

ERIOCAULON KOERNICKEI Britten

Additional & emended bibliography: Körn. in Mart., Fl. Bras. 3 (1): 475, 477—478, & 500, pl. 60, fig. 2. 1863; Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Phytologia 18: 250 & 428. 1969.

Emended illustrations: Korn. in Mart., Fl. Bras. 3 (1): pl. 60, fig. 2. 1863.

ERIOCAULON KUNTHII Körn.

Additional & emended bibliography: C. Müll. in Walp., Ann. 5: 930 (1860) and 6: 1171. 1861; Wettst., Veg. Südbras. pl. 56 & 57. 1904; Wettst., Handb. Syst. Bot., ed. 2, 814. 1911; Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 18: 253—255, 265, 266, 276, & 277. 1969.

Illustrations: Wettst., Veg. Südbras. pl. 56 & 57. 1904; Wettst., Handb. Syst. Bot., ed. 2, 814. 1911.

Bornmüller found this plant scattered in marshy campos, at 500 meters altitude, flowering and fruiting in September.

Additional citations: BRAZIL: Rio Grande do Sul: Bornmüller 591 (Mu—412, Mu—413).

ERIOCAULON LANATUM H. Hess

Additional & emended bibliography: H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 137—139 & 145, pl. 8, fig. 1, 2, & 4. 1955; E. Müll., Phytopath. Zeitschr. 23: 108. 1955; [Wiltshire], Rev.

Appl. Myc. Ind. Fungi 2: 356, 359, & Gum. Ind. 202. 1963; Moldenke, Phytologia 18: 256—257. 1969.

Müller (1955) describes the fungus, Tolyposporium hessii, from the ovaries of this species of pipewort in Angola.

ERIOCAULON LANCEOLATUM Miq.

Additional & amended bibliography: C. Müll. in Walp., Ann. 5: 926 & 942 (1860) and 6: 1171. 1861; Fyson, Journ. Indian Bot. 2: 264 & 266, pl. 23. 1921; Moldenke, Phytologia 18: 257 & 444. 1969.

Additional citations: INDIA: Kerala: Hohenacker 131 [Pl. Exsicc. Metz. 131] (Mu—209—cotype, Mu—cotype, Mu—cotype); Stocks, Law & s.n. [Malabar, Concan &.] (Mu—210).

ERIOCAULON LANIGERUM H. Lecomte

Additional bibliography: H. Lecomte, Fl. Gén. Indo-Chine 7: 2 & 8—9. 1912; Moldenke, Phytologia 18: 258. 1969.

ERIOCAULON LATIFOLIUM J. Sm.

Additional & amended bibliography: J. E. Sm. in Rees, Cycl. 13: Eriocaulon. 1809; Walp., Ann. 3: 663 (1852) and 3: 1014. 1853; C. Müll. in Walp., Ann. 6: 1171. 1861; Rendle, Cat. Afr. Pl. Welw. 2 (1): 102. 1899; Moldenke, Phytologia 18: 258—259. 1969.

Rendle (1899) tells us that E. stoloniferum Welw. is closely related to this species (which he refers to as E. rivulare G. Don).

Additional citations: DEMOCRATIC REPUBLIC OF CONGO: Devred 2116 (Mu).

ERIOCAULON LAXIFOLIUM Körn.

Additional & amended bibliography: C. Müll. in Walp., Ann. 5: 931 (1860) and 6: 1171. 1861; Moldenke, Phytologia 18: 259—260. 1969.

The Martius 1499 collection, which is the type of Eriocaulon laxifolium Körn., is also the type of Paepalanthus laxifolius Mart., the latter name apparently based on the specimen preserved in the Munich herbarium.

Additional citations: BRAZIL: Minas Gerais: Martius 1499 [Macbride photos 18687] (Mu—211—type), s.n. [Brasília prov. Minarum] (Mu—282).

ERIOCAULON LEPTOPHYLLUM Kunth

Additional & amended bibliography: C. Müll. in Walp., Ann. 5: 931 (1860) and 6: 1171. 1861; Moldenke, Phytologia 18: 260—261 & 316. 1969.

Additional citations: BRAZIL: Paraná: Reitz & Klein 17618 (N).

ERIOCAULON LEUCOGENES Ridl.

Additional bibliography: Van Royen, Nov. Guin., new ser., 10: 23, 32—35, & 44, fig. 3L. 1959; Moldenke, Phytologia 18: 261—

262. 1969.

Illustrations: Van Royen, Nov. Guin., new ser., 10: 32, fig. 3L. 1959.

Van Royen (1959) cites Boden Kloss s.n. from between 1000 and 1500 meters altitude in the Carstensz range near the Tsingaron and Bandarong rivers in Dutch New Guinea, deposited in the herbarium of the British Museum. He regards the species as endemic to New Guinea, where he says that it grows "On open ridges at high altitudes".

ERIOCAULON LEUCOMELAS Steud.

Additional & emended synonymy: Eriocaulon horsely-kundae Fyson, Fl. Nilg. & Puln. Hill-tops 3: 119. 1921. Eriocaulon horsley-kundae Fyson, Journ. Indian Bot. 2: 261, hyponym (1921) and 3: 14, pl. 44. 1922. Eriocaulon horsley-kundae megaloccephalum Fyson apud Stapf, Ind. Lond. 3: 91. 1930. Eriocaulon horsley-kondae var. megaloccephala Fyson apud C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. repr. 2, 8 [3]: 1127, in syn. 1956.

Additional bibliography: Fyson, Fl. Nilg. & Puln. Hill-tops 1: 428 & 432 (1915), 2: pl. 277 (1915), and 3: 119, pl. 543. 1921; Fyson, Journ. Indian Bot. 2: 196 & 261. 1921; Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 18: 262--265, 316, 349, 361, 362, & 439 (1969) and 19: 11. 1969.

Additional illustrations: Fyson, Fl. Nilg. & Puln. Hill-tops 2: pl. 277 (1915) and 3: pl. 543. 1921.

This species of pipewort has been collected at 6000 feet altitude, in flower and fruit in November.

Fyson (1915) describes his E. geoffreyi as follows: "I 47. Scapes solitary, very slender, 2 to 5 inches: sheath 1/2 inch, with scarious bifid mouth. Leaves 1/2 to 1 1/4 inches, flat, acute, about nine-nerved, often recurved. Heads 1/4 inch, white with the hairs of the male petals. Involucral bracts black, glabrous. Receptacle glabrous. Floral bracts obovate-cuspidate, black with thick white hairs on the back and upper margin. Male flowers:—Sepals black, united into a spathe, split down the front. Corolla tube slender tapering downwards, enlarged above and cup-shaped; petals subequal with long thick white hairs and large black glands. Female flowers:—Sepals boat-shaped. Petals oblanceolate with fine long white hairs nearly to the base. t. 277. On damp ground. Pulney hills. South India 7,500 feet. Fyson 2165, 2085. Not known elsewhere. The solitary scapes and stiff often recurved leaves are very characteristic." In his 1921 work he adds: "Vol. I p. 432, II, t. 277. Grows on bare patches on the hill sides during rainy weather (September, etc.) solitary; not tufted, and not in swamps." In the same work, for his so-called E. horsely-kundae var. megaloccephala, he says "(to be described in the Records of the Botanical Survey of India). A small plant with the habit of E. geoffreyi but with larger white heads, and differs from all our other species in the anthers being white or yellowish. t. 543. Nilgiris: Ootacamund on

slopes of Snowden. Flr. September. Fyson 6560. Coonoor, etc." The reference to volume 3 of this author's work is sometimes cited as "1920" (the titlepage date), but it was not actually issued until 1921. Stapf (1930) falls into this error.

Material of E. leucomelas has been misidentified and distributed in herbaria as E. cristatum Mart.

Additional citations: INDIA: Madras: Bambower 431 (Ca—495796, N). Mysore: Meebold 9735 (S).

ERIOCAULON LIGULATUM (Vell.) L. B. Sm.

Additional & emended bibliography: C. Müll. in Walp., Ann. 5: 930 (1860) and 6: 1171. 1861; Moldenke, Phytologia 18: 254, 265—266, & 276. 1969.

Jackson (1893) dates Körnicke's work as "1854", but the part concerning us here was actually not published until 1856.

Additional citations: BRAZIL: Minas Gerais: Regnell II.291 [2/9/1861; Macbride photos 10567] (Mu—366).

ERIOCAULON LINEARE Small

Additional bibliography: Thorne, Am. Midl. Nat. 52: 281. 1954; Moldenke, Phytologia 18: 266—269, 379—381, & 437 (1969), and 19: 32. 1969.

The A. Gray s.n. cited below was annotated as "Eriocaulon flavidulum Michx." by Körnicke and may well be the basis of his taxon of that name recognized by him in his monograph of the family as distinct from Syngonanthus flavidulus (Michx.) Ruhl.

The Meebold 28097, distributed as E. lineare, is actually E. decangulare L., while his 28099 is a mixture of Syngonanthus flavidulus (Michx.) Ruhl. and Lachnocaulon glabrum Körn., 28100 is Eleocharis geniculata (L.) Roem. & Schult. in the Cyperaceae, and 28105 is Syngonanthus flavidulus.

Additional citations: GEORGIA: County undetermined: A. Gray s.n. (Mu—204).

ERIOCAULON LINEARIFOLIUM Körn.

Additional & emended bibliography: C. Müll. in Walp., Ann. 5: 931 (1860) and 6: 1171. 1871; Moldenke, Phytologia 18: 269. 1969.

Additional citations: BRAZIL: State undetermined: Sidney 1325 [Onishi 546; Surucucu] (Z).

ERIOCAULON LONGICUSPE Hook. f.

Additional & emended bibliography: Fyson, Journ. Indian Bot. 2: 308—310 & 312. 1921; Moldenke, Phytologia 18: 269—270, 395, & 396 (1969) and 19: 44. 1969.

The Meebold 9737, distributed as E. longicuspe, is actually E. polycephalum Hook. f.

ERIOCAULON LONGIPEDUNCULATUM H. Lecomte

Additional bibliography: Moldenke, Phytologia 18: 270, 326, 327, & 367 (1969) and 19: 28. 1969.

ERIOCAULON LONGIPETALUM Rendle

Additional & emended bibliography: Rendle, Cat. Afr. Pl. Welw. 2 (1): 96—97. 1899; Engl. & Drude, Veget. Erde 9 (2): 265. 1908; Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Phytologia 18: 270—271. 1969.

Additional illustrations: Engl. & Drude, Veget. Erde 9 (2): 265. 1908.

The type collection of this species, Welwitsch 2446, was found growing almost immersed in sticky mucous derived from algae on the boggy heights of Morro de Lopollo, Angola, in the middle of May, 1860, and the original labels of the collector definitely state that this is in the province of Huila. What was the basis of Ruhland's citing of the collection to Benguela province is not apparent to me.

Rendle (1899) calls the species "A distinct little species characterised by its dense congested habit and the long protruding petal of the female flowers....A dwarf plant with the facies of Juncus pygmaeus, congested rosulate radical leaves, crowded scapes shorter than or equal to the leaves, and small whity-greenish flower-heads."

Additional citations: ANGOLA: Huila: Welwitsch 2446 (Mu-isotype).

ERIOCAULON LUZULAEFOLIUM Mart.

Additional & emended bibliography: Schnitzl., Iconogr. 1: pl. 46. 1845; C. Müll. in Walp., Ann. 5: 926 & 938 (1860) and 6: 1171. 1861; C. H. Wright, Journ. Linn. Soc. Lond. Bot. 36: 199—200. 1903; Hosseus, Beih. Bot. Centralbl. 28 (2): 369—371. 1911; Hayata, Icon. Pl. Formos. 10: 272. 1921; Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Phytologia 18: 272—274, 348, 349, 362, & 396. 1969.

Additional illustrations: Schnitzl., Iconogr. 1: pl. 46. 1845.

Hosseus found this plant growing in moors, scattered, at 1050 meters altitude, in flower and fruit in April. Material has been misidentified and distributed in herbaria as E. truncatum Hamilt. On the other hand, the Hooker & Thomson s.n. [Mont. Khasia, 0—6000 ped.], distributed as E. luzulaefolium, is actually E. truncatum Hamilt.

Additional citations: NEPAL: Bruce s.n. [Wallich 6071] (Mu—214—type, Mu—329—isotype, Mu—340—isotype); Poelt s.n. [4.9. 1962] (Mu). INDIA: Assam: Jenkins s.n. [Assam] (Mu—310). THAILAND: Hosseus 492 (Mu—404); Lindhard s.n. [8 Jan. 1904] (Mu—405).

ERIOCAULON MACROBOLAX Mart.

Additional & emended bibliography: C. Müll. in Walp., Ann. 5: 930 (1860) and 6: 1171. 1861; Körn. in Mart., Fl. Bras. 3 (1): 484—485, pl. 62, fig. 3. 1863; Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Phytologia 18: 274—275. 1969.

Illustrations: Körn. in Mart., Fl. Bras. 3 (1): pl. 62, fig.

3. 1863.

ERIOCAULON MACROPHYLLUM Ruhl.

Additional bibliography: H. N. Ridl., Journ. Fed. Malay States Mus. 6: 191 & 192. 1915; Moldenke, Phytologia 18: 275. 1969.

ERIOCAULON MAGNIFICUM Ruhl.

Additional bibliography: Griffith & Hyland, U. S. Dept. Agr. Fl. Inventory 166: 184 & 386. 1966; Moldenke, Phytologia 18: 254, 276, & 342. 1969.

Griffith & Hyland (1966) record this species as introduced and presumably cultivated in Maryland as plant introduction no. 247175, the seeds having been collected by L. Williams as his no. 18945 in Rio Grande do Sul, Brazil, where he reports that the plant was growing at 35 feet altitude, the scapes to 18 inches tall, and the flowering heads white, half an inch in diameter.

ERIOCAULON MAGNIFICUM var. GOYAZENSE Moldenke

Bibliography: Moldenke, Phytologia 18: 342. 1969.

Citations: BRAZIL: Goiás: Heringer & Lima 11717 (Z-type).

ERIOCAULON MAGNUM Abbiatti

Additional bibliography: Moldenke, Phytologia 18: 276—277. 1969.

Cabrera describes the flowers, by which he means the inflorescence heads, as white.

Additional citations: ARGENTINA: Corrientes: A. L. Cabrera 11698 (Mu).

ERIOCAULON MAJUSCULUM Ruhl.

Synonymy: Eriocaulon maiusculum Ruhl. apud Stapf, Ind. Lond. 3: 91. 1930.

Additional bibliography: Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Phytologia 18: 254 & 277. 1969.

Luetzelburg found this plant growing in high moors.

Additional citations: BRAZIL: Rio de Janeiro: Luetzelburg 6338a (Mu), 6338b (Mu).

ERIOCAULON MAMFEENSE Meikle

Additional bibliography: Moldenke, Phytologia 18: 277—278. 1969; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1968: 25. 1969.

ERIOCAULON MELANOCEPHALUM Kunth

Additional & amended bibliography: C. Müll. in Walp., Ann. 5: 931 (1860) and 6: 1171. 1861; Körn. in Mart., Fl. Bras. 3 (1): 476 & 498—500, pl. 63. 1863; Beauverd, Bull. Herb. Boiss., sér. 2, 8: 284, 286, & 287. 1908; Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Phytologia 18: 243, 279—280, & 301. 1969; Moldenke, Biol. Abstr. 50: 7996. 1969.

Emended illustrations: Körn. in Mart., Fl. Bras. 3 (1): pl.

63. 1863.

The E. A. Robinson 3759, distributed as this species, is actually E. bifistulosum Van Heurck & Muell.-Arg.

ERIOCAULON MELANOCEPHALUM subsp. USTERIANUM Beauverd

Emended synonymy: Eriocaulon usterianum Beauverd, Bull. Herb. Boiss., sér. 2, 8: 284—287, fig. 9B. 1908.

Additional & emended bibliography: Beauverd, Bull. Herb. Boiss., sér. 2, 8: 284—287, fig. 9B. 1908; Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Phytologia 18: 301—302. 1969.

Illustrations: Beauverd, Bull. Herb. Boiss., sér. 2, 8: 285, fig. 9B. 1908.

Beauverd (1908) actually seems to accept the name, E. usterianum, for this taxon; on p. 284 of his work he merely gives E. melanocephalum subsp. usterianum as a "nom. alt." for it. Under a strict interpretation of the International Rules in their present state, I suppose, both of these names would be invalidated, or, at the very least, the one here accepted.

ERIOCAULON MERRILLII Ruhl.

Additional & emended synonymy: Eriocaulon merrillii Ruhl. apud Hayata, Icon. Pl. Formos. 3: 197. 1913. Eriocaulon sollyanum var. sumatranum Van Royen, Blumea 10: 135. 1960.

Additional & emended bibliography: Hayata, Icon. Pl. Formos. 10: 272. 1921; Sasaki, Cat. Govt. Herb. 118. 1930; Van Royen, Blumea 10: 135. 1960; D. N. F. Kiehl, Blumea 10: 657. 1960; Moldenke, Phytologia 18: 186, 302, & 438. 1969.

The trinomial, E. sollyanum var. sumatranum, is based on a collection made by H. A. B. Bunnemeijer (no. 8950) in Sumatra. Van Royen (1960) also cites as the same taxon H. H. Bartlett 7457, Boesea 5963, 6008, & 10343, Bunnemeijer 5203 & 5763, Jung-huhn s.n., Lörzing 6729, and Robinson & Klose s.n. from the same island.

The E. D. Merrill 293, distributed as E. merrillii, is actually E. cinereum R. Br.

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Mindanao: M. K. Clemens 909 (Mu—390). INDONESIA: GREATER SUNDA ISLANDS: Sumatra: Boesea 5963 (N), 6008 (N).

ERIOCAULON MICROCEPHALUM H.B.K.

Emended synonymy: Eriocaulon microcephalum Kunth apud Poir. in Cuvier, Dict. Sci. Nat. 24: 241. 1822.

Additional & emended bibliography: Poir. in Cuvier, Dict. Sci. Nat. 24: 241. 1822; C. Müll. in Walp., Ann. 5: 930 (1860) and 6: 1171. 1861; Moldenke, Phytologia 18: 303—307 & 428. 1969.

Lent found this plant growing in "scattered clumps to 30 cm. in diameter" at 3300 meters altitude.

Additional citations: MEXICO: México: Pringle 6144 (Mu—350). State undetermined: J. G. Schaffner s.n. [Mexico 1875—79] (Mu—

387). COSTA RICA: Cartago: Lent 143 (N).

ERIOCAULON MILHOENSE Herzog

Additional & emended bibliography: Herzog in Fedde, Repert. Spec. Nov. 29: 204--205, pl. 120, fig. a--d. 1931; Moldenke, Phytologia 18: 308. 1969.

Illustrations: Herzog in Fedde, Repert. Spec. Nov. 29: pl. 120 a--d. 1931.

Luetzelburg found this plant growing on moist campos, flowering and fruiting in September. Herzog notes "dimeri" on the type sheet.

Additional citations: BRAZIL: Pará: Luetzelburg 21053b [Macbride photos 18689] (Mu--type).

ERIOCAULON MINIMUM Lam.

Additional & emended bibliography: Burm. f., Fl. Ind. 30, pl. 9, fig. 1. 1768; C. Müll. in Walp., Ann. 5: 926 & 937 (1860) and 6: 1171. 1861; Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Phytologia 18: 308--309 (1969) and 19: 25 & 26. 1969.

Illustrations: Burm. f., Fl. Ind. pl. 9, fig. 1. 1768.

ERIOCAULON MINUTUM Hook. f.

Additional & emended bibliography: Moldenke, Phytologia 18: 60 (1968), 18: 309--310 & 439 (1969), and 19: 35. 1969.

ERIOCAULON MIQUELIANUM Körn.

Additional synonymy: Eriocaulon radiatum Sieb. & Zucc., in herb. Cephalaria elongata Bürger, in herb.

Additional bibliography: Mak., Somoku Dzusetsu [Iconogr. Pl. Nippon] 17: pl. 49. 1912; Stapf, Ind. Lond. 3: 91. 1930; Sasaki, Cat. Govt. Herb. 118. 1930; Moldenke, Phytologia 18: 310--312 & 441 (1969) and 19: 14. 1969.

Illustrations: Ruhl. in Engl., Pflanzenreich 13 (4-30): 92, fig. 10. 1903; Mak., Somoku Dzusetsu [Iconogr. Pl. Nippon] 17: pl. 49. 1912.

Both the cheironymous names, Eriocaulon radiatum and Cephalaria elongata, appear to be based on the Bürger s.n. specimen in the Munich herbarium -- a specimen for which Ross suggests E. nipponicum Maxim., but with which suggested identification I cannot concur. This is also the type collection of E. miquelianum.

Additional citations: WESTERN PACIFIC ISLANDS: JAPAN: Kiusu: Maximowicz s.n. [Linahara, 1863] (Mu--347, Z). Island undetermined: Bürger s.n. [In Japonia] (Mu--230--isotype).

ERIOCAULON MISERUM Körn.

Additional & emended bibliography: Wall., Numer. List 207. 1832; C. Müll. in Walp., Ann. 5: 926 & 932 (1860) and 6: 1171. 1861; H. Lecomte, Journ. de Bot. 21: 89 & 90. 1908; H. Lecomte, Fl. Gén. Indo-Chine 7: 2 & 6. 1912; Moldenke, Phytologia 18: 312--313 (1969) and 19: 29 & 30. 1969.

It should be noted here that Wallich 6070 is entered very briefly and skimpily by Wallich (1832) as "6070. Eriocaulon cristatum Mart. Silhet Hk. WG & Ts".

Additional citations: PAKISTAN: East Bengal: W. Griffith 5578 (Mu—301, Mu—311). NEPAL: Bruce s.n. [Wallich 6070, in part] (Mu—217—isotype, Mu—328—isotype). INDIA: Assam: Herb. Bot. Surv. India s.n. [23.1.57] (Mu).

ERIOCAULON MODESTUM Kunth

Additional synonymy: Eriocaulon hygrophilus Mart., in herb.

Additional & emended bibliography: C. Mull. in Walp., Ann. 5: 930 (1860) and 6: 1171. 1861; Körn. in Mart., Fl. Bras. 3 (1): 476, 493, & 500, pl. 62, fig. 2. 1863; Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Phytologia 18: 261, 264, 314—318, 381, & 396. 1969.

Emended illustrations: Körn. in Mart., Fl. Bras. 3 (1): pl. 62, fig. 2. 1863.

The cheironymous name, Eriocaulon hygrophilus, is apparently based on Martius 689, in part, collected at "Villa Rica et alibi", Minas Gerais, Brazil, and deposited in the herbarium of the Staatssammlung at Munich. This collection is a mixture with E. modestum f. viviparum Herzog. L. Riedel 1476 is also a mixture of the typical form of the species and f. viviparum, and, again, the collector's label indicates more than one place of collection ["Taubaté et Mogi"]. On Luetzelburg 493 Herzog notes that "forma ♂ petalorum tubo carnosissimo-incrassato, sepalis mox solutis". Brade 6590, with rather stiffer leaves than usual, Herzog identified as "f. grandifolia Herzog".

Additional citations: BRAZIL: Bahia: Luetzelburg 493 (Mu). Minas Gerais: Martius 689, in part (Mu—289). Paraná: Reitz & Klein 17625 (N). São Paulo: Brade 6590 (Mu); L. Riedel 1476, in part (Mu—219). State undetermined: J. E. Pohl s.n. [in Brasilia] (Mu—218).

ERIOCAULON MODESTUM f. GRANDIFOLIUM Herzog

Synonymy: Eriocaulon modestum f. grandifolia Herzog, in herb.

Additional bibliography: Moldenke, Phytologia 18: 317. 1969.

The Brade 6590, identified by Herzog as f. grandifolium, seems to me to be the typical form of the species instead. It should be noted that Herzog, like Ruhland and Fyson and certain older workers, usually employed the feminine ending on subspecific epithets, regarding them as modifying the words "varietas" or "forma" rather than the generic name of the plant.

ERIOCAULON MODESTUM f. RIGIDIFOLIUM Herzog

Additional bibliography: Moldenke, Phytologia 18: 317. 1969.

This form is apparently based on Luetzelburg 1580 in the Staatssammlung herbarium at Munich. The original collector's label accompanying that specimen is inscribed "vivipar" and one

flowering head actually has a complete young plant growing from it! The leaves do not seem especially rigid to me and so I doubt very much if the form is worth maintaining as distinct from f. viviparum Herzog.

Citations: BRAZIL: Goiás: Luetzelburg 1580 (Mu—type).

ERIOCAULON MODESTUM f. VIVIPARUM Herzog

Additional bibliography: Moldenke, Phytologia 18: 316—318. 1969.

It should be noted here that the original collector's label on the type specimen of this form in the Staatssammlung herbarium at Munich also claims Goiás as the state of Brazil in which it was collected, not Bahia. The Martius 689, cited below, is a collection made at "Villa Rica et alibi", and the L. Riedel 1476 was made at "Taubaté & Mogi" — both are mixtures of this form with plants of the typical form of the species. It seems very probable that the typical plants were collected at one locality and the viviparous ones at another.

Additional citations: BRAZIL: Goiás: Luetzelburg 15510 (Mu—type). Minas Gerais: Martius 689, in part (Mu—239). São Paulo: L. Riedel 1476, in part (Mu—219).

ERIOCAULON MOLINAE L. O. Williams

Additional bibliography: Moldenke, Phytologia 18: 303 & 318—319. 1969.

Additional citations: HONDURAS: Morazán: A. Molina R. 18500 (N—isotype).

ERIOCAULON MONOCOCCOS Nakai

Additional bibliography: Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Phytologia 18: 307, 308, & 319. 1969.

ERIOCAULON MONTANUM Van Royen

Bibliography: Moldenke, Phytologia 3: 322. 1950; Van Royen, Nov. Guin., new ser., 10: 24, 32, 33, 40—42, & 44, fig. 3n. 1959; Van Royen, Blumea 10: 128. 1960.

Illustrations: Van Royen, Nov. Guin., new ser., 10: 32, fig. 3n. 1959.

This species is based on Giulianetti s.n. from Mt. Scratchley, at an altitude of about 4000 meters, Papua, New Guinea, deposited in the Rijksherbarium at Leiden. Van Royen (1959) states that the species is endemic to New Guinea, where it grows on wet slopes at high altitudes. He cites also Brass 4365 from 3680 meters on Mount Albert Edward in Papua, and remarks that "This species is closely related to E. carsonii F. Muell. from Australia but differs from that species in the much shorter leaves and peduncles and in the pubescence of leaves, bracts, sepals and petals".

Citations: MELANESIA: NEW GUINEA: Papua: Brass 4365 (Ca—1157994, N).

ERIOCAULON MUTATUM N. E. Br.

Additional & emended synonymy: Eriocaulon huillense Rendle, Cat. Afr. Pl. Welw. 2 (1): 95—96. May or June 1899 [not E. huillense Engl., 1959, nor Engl. & Ruhl., April 7, 1899]. Eriocaulon mutatum N. E. Br., in herb.

Additional & emended bibliography: Rendle, Cat. Afr. Pl. Welw. 2 (1): 95—96. 1899; N. E. Br. in Thiselt.-Dyer, Fl. Trop. Afr. 8: 256—257. 1901; Astle, Kirkia 7: 93. 1968; Moldenke, Phytologia 18: 110 & 320—321. 1969.

All the names associated with this taxon, both the valid and the invalid ones, are apparently based on the same cotype collections of Friedrich Martin Josef Welwitsch: (1) no. 2448, in almost boggy wooded marsh-meadows growing very plentifully with Gentianaceae and species of Drosera between Lopollo and Monino, Huila, Angola, the heads very black, March, April, and May, 1860; (2) no. 2449, various forms differing in age and size of head, on boggy short-grassed slopes densely packed with species of Scytonema, plentiful along with a terrestrial species of Isotles, the heads black, April and May, 1860; and (3) no. 2450, a poor form, occurs rather sparsely on the very lofty very short-grassed pastures of Empalanca which are flooded in summer, the heads black or blackish, in April, 1860. From the wording employed by Rendle it would seem that, if one of these collections were to be designated as the actual type collection, it ought to be no. 2448, which he seems to regard as the most normal. He comments that this is "A very distinct species".

The species is described by Robinson as an erect annual, with gray-black flowering heads, growing in drying moorland and along the side of "track through dambo", at 1250 meters altitude, flowering and fruiting from April to June. Astle (1968) says that it blooms from February to April and cites Astle 632 from Zambia.

Additional citations: ANGOLA: Huila: Welwitsch 2448 (Mu—cotype), 2449 (Mu—cotype). ZAMBIA: E. A. Robinson 2332 (Mu), 3733 (Mu), 5135 (Mu).

ERIOCAULON NANTOENSE Hayata

Additional synonymy: Eriocaulon nantoensis Hayata, Icon. Pl. Formos. 10: 272. 1921.

Additional & emended bibliography: Hayata, Icon. Pl. Formos. 10: 51 & 272, fig. 28. 1921; Moldenke, Phytologia 18: 324. 1969.

Hayata (1921) spells the specific epithet of this taxon "nantoense" on the illustration and on page 51 of the text, but as "nantoensis" on page 272.

ERIOCAULON NANUM R. Br.

Additional & emended bibliography: C. Müll. in Walp., Ann. 5: 926 & 934 (1860) and 6: 1171. 1861; F. M. Bailey, Compreh. Cat. Queensl. Fl. 584 & 586, fig. 565. 1913; Stapf, Ind. Lond. 3: 91.

1930; Moldenke, *Phytologia* 18: 61 (1968) and 18: 324--325. 1969.

Emended illustrations: F. M. Bailey, *Compreh. Cat. Queensl. Fl.* 586, fig. 565. 1913.

Stapf (1930) cites the illustration of this species in Bailey's work (1913) as page "588", but this is an error -- it is actually on page 586.

ERIOCAULON NAUTILIFORME H. Lecomte

Additional & emended bibliography: H. Lecomte, *Journ. de Bot.* 21: 89, 91, [101], 105--106, & 133--136, fig. 2 & 3. 1908; H. Lecomte, *Fl. Gén. Indo-Chine* 7: 2 & 7--8, fig. 1. 1912; Stapf, *Ind. Lond.* 3: 91. 1930; Moldenke, *Phytologia* 18: 325. 1969.

Illustrations: H. Lecomte, *Journ. de Bot.* 21: 106, 134, & 135, fig. 2 & 3. 1908; H. Lecomte, *Fl. Gén. Indo-Chine* 7: 7, fig. 1. 1912.

ERIOCAULON NEESIANUM Körn.

Additional & emended bibliography: C. Müll. in Walp., *Ann.* 5: 926 & 936--937 (1860) and 6: 1171. 1861; Moldenke, *Phytologia* 18: 186 & 325. 1969.

ERIOCAULON NEO-CALEDONICUM Schlecht.

Additional & emended bibliography: Moldenke, *Phytologia* 18: 270, 326--328, & 367 (1969) and 19: 28. 1969.

ERIOCAULON NEPALENSE Prescott

Additional bibliography: Moldenke, *Phytologia* 18: 348--349, 396, 429, & 433. 1969.

ERIOCAULON NIGRUM H. Lecomte

Additional & emended bibliography: H. Lecomte, *Journ. de Bot.* 21: 89, 92, 94, & 107--108. 1908; H. Lecomte, *Fl. Gén. Indo-Chine* 7: 3 & 16--17. 1912; Moldenke, *Phytologia* 18: 350--351. 1969.

ERIOCAULON NILAGIRENSE Steud.

Additional bibliography: Stapf, *Ind. Lond.* 3: 91. 1930; Moldenke, *Phytologia* 18: 351--353, 444, & 446 (1969) and 19: 11 & 22. 1969.

ERIOCAULON NIPPONICUM Maxim.

Additional bibliography: H. Lecomte, *Journ. de Bot.* 21: 89 & 90. 1908; Sasaki, *Cat. Govt. Herb.* 118. 1930; Moldenke, *Phytologia* 18: 353--357, 372, 387, & 388. 1969.

Additional citations: WESTERN PACIFIC ISLANDS: JAPAN: Honshu: Ohwi & Koyama 137 (Se--189464).

ERIOCAULON NOVOGUINEENSE Van Royen

Bibliography: Moldenke, *Phytologia* 3: 322. 1950; Van Royen, *Nov. Guin., new ser.*, 10: 41--42 & 44, fig. 5e. 1959.

Illustrations: Van Royen, *Nov. Guin., new ser.*, 10: 41, fig.

Se. 1959.

This species is based on Brass 4367 from an altitude of about 3680 meters on Mount Albert Edward, Papua, New Guinea, deposited in the Rijksherbarium at Leiden. Van Royen (1959) states that the species is endemic to New Guinea, where it grows on the edges of lakes and on marshy slopes at high altitudes. He avers that it is "Closely related to E. alpinum and E. montanum. The connate sepals of the ♀ flowers this species has in common with E. alpinum though it differs from that one in the glabrous floral bracts, sepals, and petals. E. montanum differs from the present species in the free sepals and the pubescent floral bracts, sepals and petals." He appends the following tabulation of these differences: (1) E. alpinum: inflorescence bisexual; pistillate sepals connate, blackish, hairy on the outer surface; pistillate petals with short yellow hairs at the apex; seeds with a few dark-brown longitudinal lines, glabrous; (2) E. montanum: inflorescence bisexual; pistillate sepals free, yellowish, hairy on the outer surface; pistillate petals with long white hairs at the apex; seeds with numerous upwardly-directed short hairs; and (3) E. novoguineense: inflorescence unisexual; pistillate sepals connate, yellowish, glabrous; pistillate petals glabrous; seeds with numerous longitudinal lines, glabrous.

The type collection was previously erroneously reported by me as E. brevipedunculatum Merr., which it closely resembles in its habit.

Citations: MELANESIA: NEW GUINEA: Papua: Brass 4367 (Ca—1329271—1sotype, N—1sotype).

ERIOCAULON NUDICUSPE Maxim.

Additional bibliography: Sasaki, Cat. Govt. Herb. 118. 1930; Moldenke, Phytologia 18: 357—358. 1969.

Additional citations: WESTERN PACIFIC ISLANDS: JAPAN: Honshu: Inami 956 (Se—159463).

ERIOCAULON ODORATUM Dalz.

Additional & emended bibliography: H. Lecomte, Journ. de Bot. 21: 88, 89, 107, & 108. 1908; Moldenke, Phytologia 18: 349, 359—360, 396, & 434 (1969) and 19: 44. 1969.

Lecomte (1908) writes the surname of the author of this species' name as "Dolz", obviously in error.

ERIOCAULON OLIVERI Fyson

Additional bibliography: Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Phytologia 18: 361—362 (1969) and 19: 11. 1969.

ERIOCAULON ORRADUM Van Royen.

Synonymy: Eriocaulon batavorum Van Royen, Blumea 10: 128, nom. nud. 1960.

Bibliography: Van Royen, Nov. Guin., new ser., 10: 23, [27], 34—35, & 44, fig. 1e. 1959; Van Royen, Blumea 10: 128. 1960; Mol-

denke, *Phytologia* 19: 19. 1969.

This species is based on Eyma 4765 from an altitude of 1750 meters at Wissel Lakes, northeast and east of Mount Bubeiro in west-central New Guinea, and deposited in the Rijksherbarium at Leiden. Van Royen (1959) also cites Hoogland & Pullen 6009 from Northeastern New Guinea and notes that "This species is closely related to E. sumatranum Ruhland but differs by the oblong-ovate petals with a black gland. The specific epithet is derived from the mountainous habitat." In a letter to E. Milne-Redhead, dated September 3, 1969, he says "The name Eriocaulon batavorum Van Royen was replaced in 1960 by the name Eriocaulon oreadum Van Royen, and the name has no status whatever. The mistake slipped in when I was in New Guinea and my annotation as to the change was overlooked by the editor."

ERIOCAULON ORYZETORUM Mart.

Additional bibliography: H. Lecomte, *Journ. de Bot.* 21: 89 & 92. 1908; H. Lecomte, *Fl. Gén. Indo-Chine* 7: 2 & 9--10. 1912; K. Larsen, *Dansk Bot. Ark.* 23: 380, 381, & 397, fig. 11 & 12. 1966; Ornduff, *Reg. Veg.* 55: 13 & 118. 1968; Moldenke, *Phytologia* 18: 362--363. 1969.

Additional illustrations: K. Larsen, *Dansk Bot. Ark.* 23: 380, fig. 11 & 12. 1966.

Larsen (1966) states that this species is "Distributed from N. India through Burma and Thailand to Cambodia and Laos" and continues: "Two different chromosome numbers were revealed. If this is a species with $x_2 = 15$, one is tetraploid (2255), the other hexaploid (6082). The herbarium material is very sparse, the diploid being represented by one rather small plant, and the tetraploid by a more vigorous sample, but whether this is really a significant character cannot be told at present. The chromosomes are of the same type as in E. achiton." He concludes that $2n = 60, 90$.

ERIOCAULON PALUSTRE Salzm.

Additional & amended bibliography: Körn. in Mart., *Fl. Bras.* 3 (1): 475, 480, & 500, pl. 61, fig. 1. 1863; Stapf, *Ind. Lond.* 3: 91. 1930; Moldenke, *Phytologia* 18: 365--366. 1969.

Emended illustrations: Körn. in Mart., *Fl. Bras.* 3 (1): pl. 61, fig. 1. 1863.

ERIOCAULON PAPUANUM Van Royen

Bibliography: Van Royen, *Nov. Guin., new ser.*, 10: 23, 32, 33, 37--38, 43, & 44, fig. 30. 1959.

Illustrations: Van Royen, *Nov. Guin., new ser.*, 10: 32, fig. 30. 1959.

This species is based on Womersley & Hoogland 4956 from near Nondugl, between 1800 and 2200 meters altitude, in Northeastern New Guinea and deposited in the Rijksherbarium at Leiden. Van Royen (1959) also cites Hoogland & Pullen 5397 from the same re-

gion and states that the species is endemic to New Guinea, where it grows "On wet mountainslopes at high altitudes" and is known as "mimneh" and "masul". He also remarks that "This species resembles E. truncatum Ham. in appearance but differs from that species in the absence of glands on the petals in both types of flowers and in the pubescence of the receptaculum which is glabrous in E. truncatum. A close relationship in the flowers exists with E. zollingerianum Koernicke but the new species is immediately to separate from that species by the crestless sepals of the female flowers. E. papuanum also resembles E. scariosum R. Brown from Australia but differs in the absence of glands in the petals of the female flowers. The specific epithet has been derived from the general name Papua for New Guinea."

ERIOCAULON PARKERI B. L. Robinson

Additional synonymy: Eriocaulon septangulare var. parkeri (B. L. Robinson) Boivin & Cayouette, Nat. Canad. 94: 524. 1967.

Additional bibliography: Stapf, Ind. Lond. 3: 91. 1930; Boivin & Cayouette, Nat. Canad. 94: 524. 1967; Ornduff, Reg. Veg. 50: 39 & 120. 1967; Brummitt & Ferguson, Reg. Veg. 61: 107. 1969; Moldenke, Phytologia 18: 368—371, 376, 377, 379, 381, & 437, fig. 4 (1969) and 19: 40. 1969; F. C. Seymour, Fl. N. Engl. 171. 1969.

Additional citations: MAINE: Sagadahoc Co.: Fernald & Long s. n. [Pl. Exsicc. Gray. 174] (Se—133385). MASSACHUSETTS: Plymouth Co.: S. F. Blake 10964 (Se—86960). NEW YORK: Ulster Co.: Muenschner, Winne, & Isely 20694 (Se—199204). VIRGINIA: Nansemond Co.: Fernald, Long, & Clement 15238 (N). New Kent Co.: Fernald & Long 13576 (N). NORTH CAROLINA: Tyrrell Co.: A. E. Radford 44454 (Se—211847).

ERIOCAULON PARVUM Körn.

Synonymy: Eriocaulon parvum Körn. apud Hayata, Icon. Pl. Formos. 10: 272, sphalm. 1921.

Additional & emended bibliography: Iinouma, Somoku Dzusetsu, ed. 2, 17: pl. 48. 1874; Hayata, Icon. Pl. Formos. 10: 52 & 272. 1921; Stapf, Ind. Lond. 3: 91. 1930; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] 19—21 & 23. 1940; Moldenke, Phytologia 18: 355 & 371—372. 1969.

Additional illustrations: Iinouma, Somoku Dzusetsu, ed. 2, 17: pl. 48 [in color]. 1874.

Hayata (1921) on page 272 refers to this species as mentioned also on page "55" of this work, but this is apparently a misprint for page 52.

ERIOCAULON PELLUCIDUM Michx.

Additional synonymy: Eriocaulon septemangulare Auct., in herb. [not E. septemangulare Turner, 1959].

Additional & emended bibliography: Pursh, Fl. Am. Sept. 1: 92.

1816; Nutt., Gen. 1: 90. 1818; Beck, Bot., ed. 1, 369—370 (1833) and ed. 2, pr. 1, 370. 1848; Hook. & Arn. in Hook., Brit. Fl., ed. 6, 445 & 595 (1850) and ed. 7, 458 & 606. 1855; Beck, Bot., ed. 2, pr. 2, 370. 1856; Hook. & Arn. in Hook., Brit. Fl., ed. 8, 459 & 617. 1860; Beck, Bot., ed. 2, pr. 3, 370. 1868; W. Stone, Ann. Rep. N. J. State Mus. 1910: [Fl. South. N. J.] pl. 28. 1912; Stapf, Ind. Lond. 3: 91. 1930; Ornduff, Reg. Veg. 50: 39 & 120. 1967; MacKeever, Native & Naturl. Pl. Nantucket 43. 1968; Moldenke, Phytologia 18: 370, 373—387, 425, 426, 433, & 434, fig. 5 (1969) and 19: 32. 1969; F. C. Seymour, Fl. N. Engl. 171. 1969.

Emended illustrations: W. Stone, Ann. Rep. N. J. State Mus. 1910: [Fl. South. N. J.] pl. 28. 1912.

MacKeever (1968) states that on Nantucket Island this species blooms from July to September.

Thanks to the kindness of Dr. F. C. Seymour, I am now able to state that the S. C. Brooks s.n. [Locke's Pond, July 24, 1909], cited by me in Phytologia 18: 387 (1969) as from "Locality undetermined" is from Franklin County, Massachusetts.

Additional citations: LABRADOR: Gillett & Findlay 5471 (Se—163422). NEW BRUNSWICK: Charlotte Co.: Malte 447/29 (Se—192784). Madawaska Co.: Malte & Watson 733 (Se—127429). QUEBEC: Argenteuil Co.: Rolland-Germain s.n. [August 21, 1946] (Se—165417). ONTARIO: Algoma Dist.: Taylor, Hosie, Fitzpatrick, Losee, & Leslie 1338 (Se—122335). MAINE: Waldo Co.: R. E. Friesner s.n. [8-12-36] (Se—17504). MASSACHUSETTS: Franklin Co.: Torrey, Northcraft, Dalevoryas, & Putala s.n. [Aug. 14, 1950] (Se—182700), s.n. (Se—182601). NORTH CAROLINA: Washington Co.: Pence s.n. [A. E. Radford 45084] (Se—232402). WISCONSIN: Vilas Co.: L. R. Wilson 3025 (Se—18367). MINNESOTA: Crow Wing Co.: Burglehaus s.n. [Aug. 1891] (Se—96012).

ERIOCAULON PETROSEPALUM Hayata

This binomial, previously regarded by me as representing a valid taxon, should be reduced to synonymy under E. sexangulare L., which see.

ERIOCAULON PILIPHORUM Satake

Additional bibliography: Honda, Nom. Pl. Jap. 462. 1939; Moldenke, Phytologia 18: 392. 1969.

The type of this species was collected by J. Nikai (no. 2691) at Tubakigōhigasibun-mura, in the province of Nagato, Honshu, Japan, on October 7, 1917, and is deposited in the herbarium of Tokyo University. The species is known thus far only from this type specimen.

ERIOCAULON PILOSISSIMUM Van Royen

Additional & emended bibliography: Van Royen, Blumea 10: 128, 129, & 134—135, fig. 1G. 1960; D. N. F. Kiehl, Blumea 10: 657. 1960; Moldenke, Phytologia 18: 392. 1969.

ERIOCAULON PLUMALE N. E. Br.

Additional bibliography: Moldenke, *Phytologia* 18: 393—395 & 426 (1969) and 19: 35. 1969; Anon., *Assoc. Etud. Tax. Fl. Afr. Trop. Index* 1968: 25. 1969.

ERIOCAULON PLUMALE subsp. **JAEGERI** (Moldenke) Meikle

Additional bibliography: Moldenke, *Phytologia* 18: 394. 1969; Anon., *Assoc. Etud. Tax. Fl. Afr. Trop. Index* 1968: 25. 1969.

ERIOCAULON PLUMALE subsp. **KINDIAE** (H. Lecomte) Meikle

Additional bibliography: Moldenke, *Phytologia* 18: 394—395 & 426. 1969; Anon., *Assoc. Etud. Tax. Fl. Afr. Trop. Index* 1968: 25. 1969.

ERIOCAULON PTEROSEPALUM Herzog

This binomial, previously regarded by me as valid for the taxon in question, must be discarded since it appears to be a later homonym. The taxon is discussed under *E. herzogii* Moldenke in this series of notes, which see.

ERIOCAULON PULCHELLUM Körn.

Additional & emended bibliography: Ruhl. in Engl., *Pflanzenreich* 13 (4-30): 65, 97, 99, & 287, fig. 13 E—N. 1903; Engl. & Drude, *Veget. Erde* 9 (2): 265. 1908; Stapf, *Ind. Lond.* 3: 91. 1930; Moldenke, *Phytologia* 18: 425—426. 1969.

Additional & emended illustrations: Ruhl. in Engl., *Pflanzenreich* 13 (4-30): 99, fig. 13 E—N. 1903; Engl. & Drude, *Veget. Erde* 9 (2): 265. 1908.

ERIOCAULON PULVINATUM Van Royen

Additional bibliography: Van Royen, *Nov. Guin., new ser.*, 10: 23, 32—33, & 44, fig. 3p. 1959; Moldenke, *Phytologia* 18: 427. 1969.

Additional illustrations: Van Royen, *Nov. Guin., new ser.*, 10: 32, fig. 3p. 1959.

This species is based on Brass 9997 from an altitude of 3560 meters, northeast of Mount Wilhelmina in the Nassau Range of north-central New Guinea, deposited in the Rijksherbarium at Leiden. Van Royen (1959) cites also Brass 9231 & 9282 from the same region, regards the species as endemic to New Guinea, and states that it grows there "In alpine bog turfs and open sunny bogs". He remarks that "The present species differs from *E. hookerianum* Stapf and the var. *microphyllum* Van Royen by the glabrous involucre bracts, by the very short peduncles and the cushion-like growth (from which it derives its specific epithet) while the other species is always growing solitary."

ERIOCAULON PYGMAEUM Soland.

Additional & emended bibliography: F. M. Bailey, *Compreh. Cat. Queensl. Pl.* 584 & 586, fig. 566. 1913; Stapf, *Ind. Lond.* 3: 91. 1930; Moldenke, *Phytologia* 18: 428. 1969.

Emended illustrations: F. M. Bailey, Compreh. Cat. Queensl. Pl. 586, fig. 566. 1913.

ERIOCAULON QUINQUANGULARE L.

Additional & emended synonymy: Randalia Madraspat. Graminis folio globulifer Petiv., Mus. Pet. 77. 1695. Scabiosa graminifolia, capitulis argenteis, s. Statice minima Maderaspatana Pluk., Alm. Bot. 3: 336. 1696. Gramen junceum Ind. Orient. minus, capiculo rotundo, ex paleaceis spiculis, in cacumine caulis glomerato; Graminis bufoni; aemulo, Callapillee Malabarorum, cum proxime praecedenti plurimum convenit Pluk., Alm. Bot. Mant. 98. 1700. Kokmatha minor H. Herm., Mus. Zeyl., ed. 1, 20. 1717. Eriocaulon culmo quinquangulari, calyce universali pentaphyllo L., Fl. Zeyl., ed. 1, 20. 1747. Randalia maderaspatana, graminis folio, globulifera Petiv. apud L., Fl. Zeyl., ed. 1, 20, in syn. 1747. Scabiosa gramineis nudicaulis, capitulis argenteis, sive Statice minima maderaspatana Pluk. apud L., Fl. Zeyl., ed. 1, 20, in syn. 1747. Randalia maderaspatana Petiv. apud Mart. in Wall., Pl. Asiatic. Rar. 3: 28, in syn. 1832. Gramen junceum Ind. Orient. minus, capiculo rotundo, ex paleaceis spiculis, in cacumine caulis glomerato; Graminis bufoni; aemulo, Callapillee Malabarorum, cum proxime praecedenti plurimum convenit Pluk. apud Moldenke, Phytologia 18: 429, in syn. sphalm. 1969.

Additional & emended bibliography: Pluk., Alm. Bot. 3: 336. 1696; Petiv., Mus. Petiv. 77. 1696; H. Herm., Mus. Zeyl., ed. 1, 17 & 20. 1717; Pluk., Phytogr. pl. 221, fig. 7. 1720; L., Fl. Zeyl., ed. 1, 20 (1747) and ed. 2, 20. 1748; L., Sp. Pl., ed. 1, pr. 1, 1: 87 (1753) and ed. 2, 1: 129. 1762; Hook. & Arn., Bot. Beech. Voy. 219. 1841; La Macout & Decne., Trait. Gén. Bot. 598. 1868; Hook. in La Macout, Decne., & Hook., Gen. Syst. Bot. 872. 1873; H. Lecomte, Journ. de Bot. 21: 87, 89, 91--92, & 102. 1908; H. Lecomte, Fl. Gén. Indo-Chine 7: 2 & 12--13. 1912; Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Phytologia 18: 428--435, 447, & 451 (1969) and 19: 25, 26, 29, & 38. 1969.

Additional & emended illustrations: Pluk., Phytogr. pl. 221, fig. 7. 1720; La Macout & Decne., Trait. Gén. Bot. 598. 1868; Hook. in La Macout, Decne., & Hook., Gen. Syst. Bot. 872. 1873.

The "preceding" species referred to by Plukenet (1700) is described with very similar phrases, but with "majus" replacing "minus" and with "Shaneecoree" replacing "Callapillee" -- it is a synonym of E. sexangulare L., which see.

The Plukenet (1696) reference in the synonymy above is often incorrectly cited as page "366" or dated "1720", while the Petiver (1695) reference is often cited as page "796", but the latter is a paragraph (not page) number! The original description by Petiver reads "Randalia Madraspat. Graminis folio globulifer". This elegant plant was first collected by Mr. Randal a Gardner at Fort St. George and sent to my worthy friend Mr. Charles Du-Bois".

Stapf (1930) states that the illustrations in La Maout & Decne. (1868) and the English translation by Mrs. Hooker (1873) are of "E. quinquangulare Bojer", but they are unaccredited in both works cited and I see no reason why they should be thought to represent Bojer's homonymous binomial rather than that of Linnaeus.

The Griffith 5586, Hohenacker 131 & 131c, Stocks, Law & s.n. [Malabar, Concan], T. Thomson s.n. [Plan. Ganget. Inf.], and Walker 14, distributed as E. quinquangulare, are all E. sollyanum Royle.

Additional & emended citations: INDIA: Mysore: G. Thomson s.n. [Maison & Carnatic] (S). State undetermined: R. Wight 2367F, in part (N, N).

ERIOCAULON RITCHIEANUM Ruhl.

Additional bibliography: Fyson, Journ. Indian Bot. 2: 261. 1921; Moldenke, Phytologia 18: 439. 1969.

ERIOCAULON ROBUSTIUS (Maxim.) Mak.

Additional & emended synonymy: Eriocaulon alpestre robustius Maxim. apud Stapf, Ind. Lond. 3: 90. 1930. Eriocaulon alpestre Ruhl. apud Satake in Nakai & Honda, Nov. Fl. Jap. 6: 46 & [86], in syn. 1940 [not E. alpestre Hook. f. & Thoms., 1867, nor Sasaki, 1940].

Additional bibliography: Mak., Somoku Dzusetsu [Iconogr. Pl. Nipp.] 17: pl. 50. 1912; Sasaki, Cat. Govt. Herb. 118. 1930; Stapf, Ind. Lond. 3: 90. 1930; Moldenke, Phytologia 18: 440—443. 1969.

Additional illustrations: Mak., Somoku Dzusetsu [Iconogr. Pl. Nipp.] 17: pl. 50. 1912.

Additional citations: WESTERN PACIFIC ISLANDS: JAPAN: Honshu: C. Hashimoto 850 (Se—159544); S. Suzuki s.n. [Sep. 29, 1951] (Se—141353); Togasi 915 (Se—159495).

ERIOCAULON ROBUSTO-BROWNIANUM Ruhl.

Additional & emended bibliography: K. Larsen, Dansk Bot. Ark. 23: 380, 381, & 397, fig. 13 & 14. 1966; Moldenke, Phytologia 18: 443—444 (1969) and 19: 22. 1969.

Illustrations: K. Larsen, Dansk Bot. Ark. 23: 380, fig. 13 & 14. 1966.

Larsen (1966) says that this species is "Distributed from India through Burma and Thailand to Cambodia and Laos" and continues "This has been one of the most difficult of all the strains to study cytologically on account of the great number of chromosomes, and no final establishment of the somatic number has been possible. The plate drawn as in Fig. 13 shows 103 chromosomes; this is the lowest number counted. Fig. 14 shows a plate where 111 chromosomes could be distinguished; this was one of the best. It should, however, be noted that it is more likely that there are more than 110 chromosomes than less. All the chromosomes are nearly the same size and shape, much like that found in E.

oryzetorum and E. achiton."

ERIOCAULON ROBUSTUM Steud.

Additional bibliography: Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Phytologia 18: 444-446 (1969) and 19: 11, 17, & 18. 1969.

ERIOCAULON ROSULATUM Körn.

Additional & emended bibliography: Körn. in Mart., Fl. Bras. 3 (1): 486-488 & 500, pl. 61, fig. 3. 1863; Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Phytologia 18: 447-448. 1969.

Emended illustrations: Körn. in Mart., Fl. Bras. 3 (1): pl. 61, fig. 3. 1863.

ERIOCAULON ROUXIANUM Steud.

Additional bibliography: Moldenke, Phytologia 18: 448 (1969) and 19: 36. 1969.

ERIOCAULON SACCATUM Van Royen

Bibliography: Van Royen, Nov. Guin., new ser., 10: 22, 36, & 42-44, fig. 4q. 1969.

Illustrations: Van Royen, Nov. Guin., new ser., 10: 36, fig. 4q. 1959.

This species is based on Hoogland & Pullen 5398 from the Upper Asaro Valley, at an altitude of about 1800 meters, in North-eastern New Guinea, deposited in the Rijksherbarium at Leiden. Van Royen (1959) cites also Kanehira & Hatusima 13542 from Dutch New Guinea. He avers that the species is endemic to New Guinea, where it grows "in very wet muddy patches on mountain slopes at high altitudes" and is known as "mirmeh" and "masul". He comments that "This species resembles in its flowers E. scariosum R. Brown and E. papuanum Van Royen but differs from either species in the saccate sepals of the female flowers and the long white hairs at the inside of these sepals. This detail it shares with E. zollingerianum Koernicke, but there the sepals are broadly serrate-cristate."

ERIOCAULON SCARIOSUM J. Sm.

Additional & emended bibliography: Körn. in Mart., Fl. Bras. 3 (1): 500. 1863; Benth. & F. Muell., Fl. Austral. 7: 190-193, 197, 792, & 793. 1878; F. M. Bailey, Weeds & Poison. Pl. Queensl. 207. 1906; Stapf, Ind. Lond. 3: 91. 1930; Van Royen, Nov. Guin., new ser., 10: 38 & 43. 1959; M. Gray, Contrib. N. S. Wales Nat. Herb. 3: 7. 1961; J. W. Vickery, Contrib. N. S. Wales Nat. Herb. 3: 450. 1965; Moldenke, Phytologia 18: 264, 326, 327, & 450-451 (1969) and 19: 28. 1969.

Continuing Körnische's description of his E. smithii var. α : "foliis plerumque 9-nerviis (Hb. Holm. ded. Smith). Leg. Sieber no. 582 (Hb. Berol. et Schldl.) et D'Urville (Hb. Berol.) et Lhotzky (Hb. Steudel). var. β -- minor; pedunculis usque 2 1/2-pollicaribus; foliis 4-5-nerviis. Botany Bay Bush Martio leg.

Leichhardt (Hb. Berol.). var. γ — pedunculis usque 6-pollicaribus; foliis plerumque 7—, angustioribus 5-nerviis. Leg. Sieber (Hb. Vindob.)." He also notes "In Brasilia non crescit. Cl. Steudel specimina Lhotskyana sine loco natali indicato e Brasilia esse allata inuste suspicatus est".

It should be noted that Bentham & Mueller (1878) for E. scariosum [= E. brunonis] cite R. Brown s.n. and Schultz 261 from North Australia, while for E. smithii [= E. scariosum] they cite Beckley s.n., R. Brown s.n., and Woolfs s.n. from New South Wales, Bowman s.n., F. Mueller s.n., and Wuth s.n. from Queensland, and F. Mueller s.n. from Victoria.

Eriocaulon lhotskyi is based on an unnumbered collection made by Johann Lhotsky — in whose honor it is named. Steudel, in his original description (1855) — as indicated above — avers that it is from "Brasilia", but the label on the Berlin specimen, doubtless an isotype, is plainly inscribed "N. Holl." [=Australia]. Steudel's publication is sometimes erroneously cited as "1885".

Van Steenis (1950) reviews the status of the genus Busseuillia as follows: "Lesson placed this genus in the Restiaceae. The floral structure, however, points undubitably to Eriocaulon L., though Lesson, in his description, made a mistake in believing that the petals of the female flowers were stigmas. He mentions the flowers to be dioecious, but probably means 'unisexual'. In determining the species with Australian floras one comes to E. smithii R. Br., which according to J. Britten.....should be called E. scariosum Sm. in Rees. In the Paris Herbarium I have searched, April 1949, for the original sheet, with the kind assistance of Mr Willmann. Unfortunately we did not (wholly) succeed. The only sheet we found which might be the type of Busseuillia was an 'ex herb. Brongniart'. The label was written by Spach under the name of E. smithii, stated to have been collected at 'Port Jackson, Nouvelle Hollande, d'Urville, 1825'. This, however, is a mistake, as Dumont d'Urville was, in that year, not in Australia. The specimen, however, is not a replica of the figure as the large rosette leaves of the figure (typical of juvenile E. smithii) are absent. Moreover, the analysis-drawing present on the sheet is not conformable to the figure published. On the other hand hardly any other sheet at Paris can possibly represent the type of Busseuillia. As the names of the Australian species of Eriocaulon antedate in general Busseuillia, the specific epithet has, fortunately, little significance for purposes of priority. The generic name Busseuillia smoothly disappears in the synonymy of Eriocaulon. In the Muséum d'Histoire Naturelle at Paris is a list of the collections of the 'Chirurgien Major' Busseuil in his own handwriting, dated Brest, le 20 juillet 1826. On page 4 of this list there is an enumeration of plants from Australia in which two are entered as 'incon-

mu'. One of them will probably have been Busseuillia." It should be noted that Salisbury (1953) still places Busseuillia in the Restionaceae, crediting the species as from New South Wales, but Airy Shaw (1966) places it correctly in the synonymy of Eriocaulon. The genus was, of course, named in honor of F. L. Busseuil.

Although Kunth (1841) and Jackson (1895) both cite the Randallia scariosa binomial to Desvaux (1828), the combination does not actually occur in the reference cited. It is only implied there, and this does not constitute valid publication or even effective publication!

Guillaumin (1948) includes this species in his enumeration of the flora of New Caledonia, but I have not as yet seen any material of it from there. He distinguishes it from the other species known to him from New Caledonia as follows:

1. Plante robuste; feuilles longues de 20—35 cm.; capitules globuleux, à pédoncule à 6 côtes, long de 20—30 cm.....
E. pancheri.
- 1a. Plantes plus petites; feuilles longues de 13 cm., au plus.
2. Capitules globuleux.
3. Pédoncules à côtes bien nettes.
4. Pédoncule à 6 côtes, long de 14—16 cm.; feuilles longues de 5—13 cm., verticille externe du périgone de la fleur ♀ à pièces obtuses.....E. comptonii.
- 4a. Pédoncule à 5 côtes, long de 8—20 cm.; feuilles longues de 3—7 cm.; verticille externe de la fleur ♀ à pièces aiguës, ovales.....E. scariosum.
- 3a. Pédoncule presque cylindrique, long de 5—8 cm.; feuilles longues de 3—7 cm.....E. neo-caledonicum.
- 2a. Capitules turbinés, très petites, à pédoncule à 7 côtes, extrêmement long (80 cm., 1 m.).....E. longepedunculatum.

Briggs (1966) records the chromosome number for E. scariosum as $2n = 64$, based on N. A. Banks 64027 as voucher specimen. Hubbard describes the plant as having whitish inflorescences, forming a carpet of dark-green fleshy leaves, common among sedges and Juncus in swamps, at 130 feet altitude, flowering and fruiting in November. It has also been collected in flower and fruit in February and May.

Däniker (1932) says "E. Schmithii R. Br. Prodr. 254. 1810. NC : D[äniker] 186, bl. u. bt., in dem sumpfigen Neiderungen des Yatétales (4. X. 24) kleines Kraut mit grundständigen fadenförmigen Blättern, sehr oft".

Evans (1966) cites Steudel's original publication of E. lhot-skyi as "1885", instead of 1855, and says that this species grows in New South Wales, Queensland, and Victoria. In New South Wales he states that it inhabits "wet ground at margins of ponds and lagoons, in bogs and swampy places and along the sides of roadside drains, usually on sandy soils" in the Coast, Tablelands, and

Central Western Slopes regions. He cites the following specimens from New South Wales: Bäuerlen s.n. [12.1884; 58383], s.n. [12.1894; 58368]; Betche s.n. [1.1883; 58371]; Blakely s.n. [4.1900; 58381]; Camfield s.n. [2.1899; 58377], s.n. [10.1893; 58379], s.n. [12.1894; 58380]; Cheel s.n. [11.1898; 58375]; Constable s.n. [1.1953; 22204], s.n. [1.1956; 36567], s.n. [7.1963; 64028, 64029, 66136], s.n. [1.1964; 64027, 64030, 64031]; Davis s.n. [1.1950; 52578], s.n. [12.1954; 58370]; Deane s.n. [12.1884; 58373, 58376]; Evans s.n. [5.1960; 63147]; Forsyth s.n. [12.1896; 58374]; Froggatt s.n. [12.1893; 58378]; Garden s.n. [10.1951; 17743]; Gray s.n. [2.1961; 58382]; Ingram s.n. [3.1952; 66343]; Johnson & Constable s.n. [8.1953; 26368]; Maiden s.n. [12.1908; 58367]; McBaron s.n. [4.1962; 57095]; McKee s.n. [1.1953; 58372]; Mueller s.n. [1953; 58384]; O'Grady s.n. [1960; 58369]; Rodway s.n. [4.1925; 52581], s.n. [1.1934; 52580], s.n. [7.1935; 52579].

The Perrottet 1166, distributed at E. scarosum, is actually E. leucomelas Steud., while Flecker 2257 is E. nanum R. Br.

Additional citations: AUSTRALIAN REGION: AUSTRALIA: New South Wales: Boorman s.n. [Wallangarra, 1.1918] (S); Leichhardt s.n. [Botany Bay Bay Bush, 1842] (B); V. May s.n. [Elenora Heights, 28/1/35] (Go); McKie s.n. [Guyra, 3 Jan. 1935] (S); Meebold 2641 (Mu), 6392 (Mu), s.n. [Rose Bay, Mai 1933] (Mu, Z). Queensland: Flecker 1193 (Qu); C. E. Hubbard 3459 (S), 4755 (S); Meebold 8073 (Mu). State undetermined: D'Urville s.n. [Nova Hollandia] (B); Herb. Admiralität s.n. [Nova Hollandia] (S, Ut—323); Herb. Roth s.n. (B); Lhotsky s.n. [N. Holl.] (B); Sieber Fl. Nov. Holl. 582 (B); J. E. Smith 4 (S), 5 (S); Wollengong s.n. (B). MOUNTED ILLUSTRATIONS: Herb. Palat. Vindob. Icon. Variae 23 (V); Weloszak s.n. (V—6512).

ERIOCAULON SCHIEDEANUM Körn.

Additional & emended synonymy: Eriocaulon jaliscanum S. Wats., Proc. Am. Acad. 26: 157. 1891. Eriocaulon microcephalum Cham. & Schlecht. apud Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 878, in syn. 1893 [not E. microcephalum Hook. & Arn., 1854, nor Humb. & Bonpl., 1818, nor H.B.K., 1816, nor Humb. & Kunth, 1841, nor Kunth, 1826, nor Sellow, 1959].

Bibliography: Cham. & Schlecht., Linnaea 6: 43. 1831; Körn. in Mart., Fl. Bras. 3 (1): 492—493. 1863; C. Müll. in Walp., Ann. 5: 930 (1860) and 6: 1171. 1861; S. Wats., Proc. Am. Acad. 26: 157. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 878. 1893; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 158. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 43, 56, 113, 286, & 287. 1903; H. B. Davis, Life & Works Pringle 123 & 141. 1936; Moldenke, N. Am. Fl. 19 (1): 20 & 36—37. 1937; Moldenke, Phytologia 1: 322—323. 1939; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 2, 158. 1941; Moldenke, Known Geogr. Distrib. Erioc. 4, 36, & 39.

1946; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 878. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 30 & 206. 1949; Moldenke, Phytologia 3: 344. 1950; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 158. 1959; Moldenke, Résumé 36, 289, & 483. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 878. 1960; Moldenke, Résumé Suppl. 4: 4 (1962), 13: [1] (1966), and 14: [1]. 1966; Moldenke, Phytologia 17: 395 (1968) and 18: 303 & 304. 1969.

Jackson (1893) cites an Eriocaulon microcephalum Cham. & Schlecht. to Linnaea 6: 43 (1831), but Chamisso & Schlechtendal do not at that place propose any such new homonymous binomial. What they say is merely "Eriocaulon species. An E. microcephalum HBK., 1, p. 201? — in paludibus prope Hacienda de la Laguna. Oct." The collection to which they refer here is the type collection of E. schiedeana, Schiede 967.

The E. microcephalum of H.B.K. is a valid species, with the homonymous variations in accreditation attributed to Humboldt & Bonpland, to Humboldt & Kunth, and to Kunth alone as synonyms; the E. microcephalum of Hooker & Arnott is E. ehrenbergianum Klotzsch, while that of Sellow is Paepalanthus tortilis (Bong.) Mart.

Eriocaulon schiedeana has been found growing at altitudes of 1900 to 2600 meters, flowering and fruiting from September to November. McVaugh found it to be "abundant" in seepage areas over rocks and "very abundant in turf of all grassy openings" in open forests of Quercus macrophylla. Feddema describes it as "common" in grassy areas in pine-oak savannas and in grassy areas in oak woodlands "with much Dodonaea and many grasses". Ripley & Barneby encountered it in short moist turf of mountain parks in the coniferous belt of Durango, Mexico.

Pringle 6146 in some herbaria is a mixture with E. bilobatum Morong, while Arsène 5532 is a mixture with something in the Cyperaceae.

Additional & emended citations: MEXICO: Chiapas: Breedlove & Raven 13416 (Ac). Durango: Ripley & Barneby 13983 (Ac). Jalisco: Barnes & Land 159 (F—356912); Feddema 2295 (Mi); R. McVaugh 13106 (Mi), 13651 (Mi), 17578a (Mi); Pringle 6146, in part (Br, Ca—115172, Dt, Mn—7957, Ms—15474, Mu—353, S, S). Michoacán: Arsène 5532, in part (W—1000073, Z). Veracruz: Schiede 967 (B—type). Zacatecas: Feddema 2482 (Mi).

ERIOCAULON SCHIMPERI Körn.

Additional & emended synonymy: Eriocaulon schimperianum Körn. apud Ruhl. in Engl., Pflanzenreich 13 (4-30): 77 & 287. 1903. Eriocaulon congense Moldenke, Phytologia 2: 218—219. 1947. Eriocaulon volkensis var. mildbraedii Ruhl. ex Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 206, nom. nud. 1949. Eriocaulon montanum Körn. ex Moldenke, Résumé Suppl. 1: 17, in syn. 1959 [not E. montanum Van Royen, 1959].

Bibliography: Engl., Abh. Preuss. Akad. Wiss. [Abh.

Akad. Wiss. Berlin] 1891: 154. 1892; Ruhl. in Engl., Bot. Jahrb. 27: 80. 1899; N. E. Br. in Thiselt.-Dyer, Fl. Trop. Afr. 8: 243. 1901; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 158. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 62, 77, & 287. 1903; Bullock, Kew Bull. Misc. Inf. 1932: 507. 1932; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 2, 158. 1941; J. Hutchinson, Botanist South. Afr. 528. 1946; Moldenke, Known Geogr. Distrib. Erioc. 20 & 39. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 110, 115-117, & 206. 1949; Moldenke, Phytologia 3: 333 & 344. 1950; E. J. Salisb., Ind. Kew. Suppl. 11: 88. 1953; Robyns & Tournay, Fl. Spém. Parc Nat. Alb. 3: 314-315. 1955; Moldenke, Résumé 135, 142-144, 287, 292, 426, & 483. 1959; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 158. 1959; Moldenke, Résumé Suppl. 1: 10, 15, 17, & 18 (1959) and 16: 8. 1968; M. E. S. Morrison, Journ. Ecol. [Brit.] 56: 373. 1968; Moldenke, Phytologia 18: 91 & 303. 1969.

It should be noted here that the original publication of this binomial was without description; therefore the correct citation for it is "Körn. ex Engl., Abh. Preuss. Akad. Wiss. [Abh. Akad. Wiss. Berlin] 1891: 154, nom. nud. (1892); Ruhl. in Engl., Bot. Jahrb. 27: 80. 1899". The type, Schimper 1217, deposited in the herbarium of the Botanisches Museum at Berlin, is also the type of Körnicke's E. montanum, a name which he apparently never published. Mildbraed 1690, in the same herbarium, is the type of E. volkensis var. mildbraedii Ruhl.

This species has been found by collectors in boggy ground, mountain swamps, and shallow rivers, at altitudes of 1800 to 3500 meters, flowering and fruiting in January and October. Schlieben 55 & 3487 have very small and narrow leaves, while 1135a has them large and broad. Bullock (1932) avers that the species is related to E. friesiorum Bullock. Robinson calls it an erect annual, with fresh-green rather succulent leaves. Morrison (1968) records it from Uganda.

Robyns & Tournay (1955) cite Burt 2799, DeWitte 1985 & 1988, Humbert 8677, and Mildbraed 1690 from the Albert National Park. Hutchinson (1946) cites his no. 4033. The Stuhlmann 9143, distributed as E. schimperi, is actually the type collection of E. mesanthemoides Ruhl., but my friend and colleague, Edgar Milne-Redhead, regards these two taxa as conspecific.

Additional citations: ETHIOPIA: Herb. Mus. Bot. Berol. s.n. (B); Schimper 1217 (B-type, V-isotype). DEMOCRATIC REPUBLIC OF CONGO: DeWitte 1985 (S, S), 1988 (S); Humbert 8099 (B). BURUNDI: Lewalle 1420 (Ac), 2337 (Rf). RWANDA: Humbert 8677 (B); Mildbraed 1690 (B, Z). TANZANIA: Tanganyika: Mildbraed 978 (B); Schlieben 55 (B), 1135a (B), 3487 (B, Mu, S). ZAMBIA: E. A. Robinson 3967 (Mu). MALAWI: Brass 17232 (N); E. A. Robinson 3032 (Mu).

ERIOCAULON SCHIMPERI var. GIGAS Moldenke

Bibliography: Moldenke, Phytologia 2: 364. 1947; Moldenke, Known

Geogr. Distrib. Verbenac., [ed. 2], 118 & 206. 1949; Moldenke, Phytologia 3: 344. 1950; Moldenke, Résumé 146 & 483. 1959.

ERIOCAULON SCHIPPPII Standl.

Synonymy: Eriocaulon schippii (Standl.) Moldenke apud H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 126 & 128. 1955.

Bibliography: Standl. in Standl. & Record, Field Mus. Publ. Bot. 12: 90. 1936; Moldenke, M. Am. Fl. 19 (1): 20 & 34. 1937; Moldenke, Phytologia 1: 323. 1939; Moldenke, Carnegie Inst. Wash. Publ. 522: 142. 1940; Moldenke, Known Geogr. Distrib. Erioc. 4 & 39. 1946; Hill & Salisb., Ind. Kew. Suppl. 10: 86. 1947; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 36 & 206. 1949; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 126—130, fig. 2, & pl. 7, fig. 1—5. 1955; Moldenke, Résumé 43, 147, 292, & 483. 1959; Moldenke, Phytologia 18: 243 & 280. 1969.

Illustrations: H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 127, fig. 2, & pl. 7, fig. 1 & 3. 1955.

Hess (1955) adopts the name, E. schippii, for Angolan material which is more probably referable to the African counterpart of this American species, E. bifistulosum Van Heurck & Muell.-Arg. I would be very much surprised to find the American plant in Angola. He gives very detailed so-called "amplified" descriptions of E. schippii which, he says, are taken entirely from the type collection (Schipp 647) from British Honduras. He is very emphatic in his statement that he regards the British Honduran and Angolan material as conspecific. "Standley hat 1936 die Art nur als nomen publiziert.....Von Moldenke (1937) stammt eine gültige und ausführliche Diagnose. Zum Vergleich stand mir aus dem Botanischen Museum der Universität Zürich ein Bogen Cotypus-Material zur Verfügung, gesammelt von W. A. Schipp, am 11.9.1930, unter Nr. 647 in All Pines, British Honduras. Davon wurden ungefähr 30 Blüten aus verschiedenen Köpfen untersucht und ausgemessen. In verschiedenen Punkten erfasst die Diagnose von Moldenke die Variationsbreite der Merkmale nicht. Um die einigen Exemplare aus Angola vergleichen zu können, muss die Diagnose von Eriocaulon Schippii eingehend diskutiert werden.....Habituell stimmen die Pflanzen aus Angola mit dem Cotypus-Material von Eriocaulon Schippii vollständig überein. Die Halme sind aber etwas feiner als bei der Pflanze aus Honduras; sie sind 0,4—0,5 mm dick. Die Scheiden der Halme weisen nicht regelmässig zwei Zipfel auf. Sie sind oft nur schief abgeschnitten und aufgeschlitzt. Unter der dem Halm meist anliegenden häutigen Spitze sind die Scheiden oft etwas aufgeblasen. Das Cotypus-Material von E. Schippii reicht nicht aus, um sichere Unterschiede an den Scheiden finden zu können. Die Köpfe stimmen in Form und Grösze überein. Es ist wichtig, dass nur Blütenköpfe, die sich im gleichen Entwicklungsstadium befinden, miteinander verglichen werden. Im allgemeinen ist die Farbe der Blütenköpfe am afrikanischen Material etwas heller als an den Pflanzen aus Honduras. In der Grösze, Form und Farbe der Hüll- und Blüten-Brakteen sind aber keine Unterschiede fest

zustellen.....Die Vergleiche zeigen, dass zwischen Eriocaulon Schippii aus British Honduras und den Pflanzen aus Angola kleine Unterschiede bestehen. Diese sind aber nur graduell, und es besteht bei keinem Merkmal ein deutlicher Hiatus. Der Unterschied in den Sepalen der ♀ Blüten, wie er in der Aufnahme (Taf. 7, Abb. 1, 2) klar zum Ausdruck kommt, kann nach Untersuchung vieler Blüten von verschiedenen Pflanzen nicht mehr als trennendes Merkmal gelten."

Hess cites only Hess 52/837 from Benguela, Angola, collected about 8 km. east of Vila Mariano Machado (Ganda), alongside the road to Nova Lisboa, at about 1200 meters altitude, on February 26, 1952. He notes that "In einem ausgedehnten Sumpf, auf sandig-moorigem Boden, in langsam fließendem, etwa 5 cm tiefen Wasser ist Eriocaulon Schippii häufig. Als Begleiter sind E. pictum Fritsch und E. Teusczii Engl. et Ruhl. zu nennen....Das Material ist einheitlich." He continues "Bisher war Eriocaulon Schippii nur durch das von W. A. Schipp gesammelte, eingangs zitierte Material aus British Honduras bekannt. Das Vorkommen dieser Pflanze in Süden von Angola ist pflanzengeographisch interessant. Es ist dies ein neuer Hinweis auf ein altes afrikanisch-amerikanisches Florenareal.....Eriocaulon Schippii steht der in Pakistan, Indien, Ceylon und Australien verbreiteten E. setaceum L. nahe. E. setaceum hat aber behaarte Sepalen und Petalen in den ♀ Blüten. Eriocaulon Schippii ist auch mit E. bifistulosum van Heurck et Müll. Arg. nahe verwandt. E. bifistulosum hat aber stets kahle Brakteen, Sepalen und Petalen; zudem sind die Pflanzen immer viel größer und haben auch größere Blütenköpfe. Eriocaulon submersum Welw. ex Rendle kann trotz gewissen habituellem Ähnlichkeiten und den übereinstimmenden Ansprüchen an den Standort nicht als verwandt mit E. Schippii angesehen werden."

Additional & emended citations: BRITISH HONDURAS: Schipp 647 (B—isotype, Ca—426826—isotype, F—621912—isotype, S—isotype).

ERIOCAULON SCHLECHTERI Ruhl.

Bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 78. 1899; Ruhl. in Engl., Pflanzenreich 13 (4-30): 13, 103, 109, & 287. 1903; Thiselet.—Dyer, Ind. Kew. Suppl. 2: 70. 1904; Moldenke, Known Geogr. Distrib. Erioc. 22 & 39. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 120 & 206. 1949; Moldenke, Résumé 150 & 483. 1959.

Citations: MOZAMBIQUE: Gazaland: F. R. R. Schlechter 12093 (B—type, Z—isotype).

ERIOCAULON SCHOCHIANUM Hand.-Mazz.

Bibliography: Hand.-Mazz., Anz. Akad. Wiss. Wien 57: 238. 1920; A. W. Hill, Ind. Kew. Suppl. 6: 79. 1926; Hand.-Mazz., Symb. Sin. 7: 1245. 1936; Moldenke, Known Geogr. Distrib. Erioc. 25 & 39. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 132 & 206. 1949; Moldenke, Résumé 170 & 483. 1959; Moldenke,

Résumé Suppl. 17: 5. 1968.

ERIOCAULON SCHOCHIANUM var. PARVICEPS Hand.-Mazz.

Bibliography: Hand.-Mazz., Symb. Sin. 7: 1246. 1936; Moldenke, Résumé Suppl. 17: 5. 1968.

This variety is described from and is probably endemic to Yunnan, China.

ERIOCAULON SCHULTZII Benth.

Bibliography: Benth. & F. Muell., Fl. Austral. 7: 191, 195—196, & 792. 1878; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 879. 1893; Ruhl. in Engl., Pflanzenreich 13 (4-30): 66, 98, & 287. 1903; Moldenke, Known Geogr. Distrib. Erioc. 28 & 39. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 879. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 153 & 206. 1949; Moldenke, Résumé 209 & 483. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 879. 1960.

It is worth noting here that the isotype sheet of this species in the herbarium of the Botanisches Museum at Berlin bears a label inscribed "Adelaide. Rich. Schomburgk". Ruhl. (1903), however, gives the place of collection of the type as "Port Darwin" and the collector as Fred Schultz — in whose honor Benth. obviously named the species.

Citations: AUSTRALIAN REGION: AUSTRALIA: Northern Territory: F. Schultz 288 (B—isotype, Z—isotype).

ERIOCAULON SCHWEICKERDTI Moldenke

Bibliography: Moldenke, Phytologia 3: 416—417. 1951; G. Taylor, Ind. Kew. Suppl. 12: 55. 1959; Moldenke, Résumé 149 & 483. 1959.

Dr. H. Wild, in a letter to me dated January 10, 1953, states that the type locality for this species — along the Nyamshatu River, Umtali District — is in Rhodesia, not in Natal as erroneously stated by me in my original publication (1951).

Citations: RHODESIA: Fisher & Schweickerd 234 [Govt. Herb. Salisbury 22824] (N—isotype, N—photo of type, Rh—22824—type, Z—photo of type).

ERIOCAULON SCLEROCEPHALUM Ruhl.

Synonymy: Eriocaulon sclerocephalum Ruhl. ex Moldenke, Phytologia 3: 385, in syn. 1950.

Bibliography: Ruhl. in Fedde, Repert. Spec. Nov. 22: 31. 1925; A. W. Hill, Ind. Kew. Suppl. 7: 89. 1929; Moldenke, N. Am. Fl. 19 (1): 19 & 26. 1937; Moldenke, Phytologia 1: 323. 1939; León, Fl. Cuba 1: 281. 1946; Moldenke, Known Geogr. Distrib. Erioc. 4 & 39. 1946; Alain, Contrib. Ocas. Mus. Hist. Nat. Coleg. La Salle 7: 47 & 114. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 43, 45, & 206. 1949; Moldenke, Phytologia 3: 385. 1950; Moldenke, Résumé 51, 53, 292, & 483. 1959; Moldenke, Phytologia 18: 243. 1969.

This species is known only from white sandy savannas, flower-

ing and fruiting in January, February, October, and November. The Carabia 1151, distributed as E. sclerocephalum and so cited by me in my 1950 work, is actually E. arenicola Britton & Small. Material of E. sclerocephalum, on the other hand, has been misidentified and distributed in herbaria as E. sigmoideum C. Wright.

Additional citations: CUBA: Pinar del Río: Ekman 10822 (S--cotype). ISLA DE PINOS: Britton, Britton, & Wilson 11948 (S); Ekman 11975 (S--cotype), 11990 (S--cotype), 12191 (N--photo of cotype, S--cotype, Z--photo of cotype); Killip 44754 (Mu, N, Z), 45361 (Mu), 45381 (Sm).

ERIOCAULON SEDGWICKII Fyson

Bibliography: Fyson, Journ. Indian Bot. 1: 50 (1919) and 2: 260--261, pl. 16. 1921; A. W. Hill, Ind. Kew. Suppl. 6: 79 (1926) and 7: 89. 1929; Moldenke, Known Geogr. Distrib. Erioc. 23 & 39. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 127 & 206. 1949; Moldenke, Résumé 162 & 483. 1959; Thanikaimoni, Pollen & Spores 7: 186. 1965.

Illustrations: Fyson, Journ. Indian Bot. 2: pl. 16. 1921.

Fyson (1921) bases this species on Sedgwick 4548, 4572, 4648, 4671, 4837, & 4847 "in Herb. Pres. Coll. Madras" and collected in "Bombay, Mahabaleshwar on hill sides, on rocks, etc." He comments that the species is "Remarkable for the very dense covering of white hairs on the floral bracts making the heads snow-white; and for the broad female petals and their large glands. In general appearance and in the broad female petals the plants are often very like plants of E. horsley-kundae Fyson, Var megalocephala, No. 47, collected by Talbot and Meebold from the Bababoodans to the Nilgiris. The female petals are like also those of E. Geofreyi, E. Colletti, etc. where however the receptacle is glabrous. I cannot find anything in Ruhland's monograph to correspond with this and therefore suggest a new species."

Citations: INDIA: Bombay: L. J. Sedgwick 4648 (S--cotype, Z--cotype).

ERIOCAULON SEEMANNII Moldenke

Synonymy: Eriocaulon seemanii Moldenke apud L. O. Williams, Fieldiana Bot. 31: 256, sphalm. 1967.

Bibliography: Moldenke, N. Am. Fl. 19 (1): 19 & 28--29, 1937; Moldenke, Phytologia 1: 323. 1939; Moldenke in Woodson & Schery, Ann. Mo. Bot. Gard. 31: 66--67, fig. 95. 1944; Moldenke in Woodson & Schery, Fl. Panama 470--471, fig. 95. 1944; Moldenke, Known Geogr. Distrib. Erioc. 4 & 40. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 37, 41, & 206. 1946; Hill & Salisb., Ind. Kew. Suppl. 10: 86. 1947; Moldenke, Phytologia 3: 385. 1950; Moldenke, Résumé 44, 48, & 483. 1959; L. O. Williams, Fieldiana Bot. 31: 256. 1967; Moldenke, Résumé Suppl. 17: 10. 1968; Moldenke, Phytologia 18: 318. 1969.

Illustrations: Moldenke in Woodson & Schery, Ann. Mo. Bot.

Gard. 31: 66, fig. 95. 1944; Moldenke in Woodson & Schery, Fl. Panama 470, fig. 95. 1944.

The Swallen 11173, distributed as E. seemannii, is actually E. molinae L. O. Williams.

ERIOCAULON SEKIMOTOI Honda

Bibliography: Honda, Bot. Mag. Tokyo 45: 299. 1931; Nemoto, Fl. Jap. Suppl. 1040. 1936; A. W. Hill, Ind. Kew. Suppl. 9: 105. 1938; Honda, Nom. Pl. Jap. 463. 1939; Satake in Nakai & Honda, Nov. Fl. Jap. 6: 14, 75, 76, 81, & 87, fig. 40. 1940; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] 63-64, pl. 11, fig. 22. 1940; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 134 & 206. 1949; Moldenke, Résumé 173 & 483. 1959; Koyama in Kitamura, Murata, & Koyama, Col. Illustr. Herb. Pl. Japan 3: 180, 181, & 430, fig. 123 (4). 1964.

Illustrations: Satake in Nakai & Honda, Nov. Fl. Jap. 6: 76, fig. 40. 1940; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] pl. 11, fig. 22. 1940; Koyama in Kitamura, Murata, & Koyama, Col. Illustr. Herb. Pl. Japan 3: 180, fig. 123 (4). 1964.

This species is based on H. Sekimoto 3, collected at Kataokamura, in the province of Simotuke, Honshu, Japan, on September 18, 1930, deposited in the herbarium of the University of Tokyo, and is named in honor of the collector. It is known thus far only from the type collection. Vernacular names recorded for it are "inunohige-modoki" and "nise-inunohige".

ERIOCAULON SEKIMOTOI f. GLABRUM Satake

Bibliography: Satake in Nakai & Honda, Nov. Fl. Jap. 6: 77 & 87. 1940; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] 64. 1940; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 134 & 206. 1949; Moldenke, Résumé 173 & 483. 1959.

This form differs from the typical form of the species in having the receptacle glabrous and the involucral bractlets as long as or slightly shorter than the flowering heads.

The form is based on H. Sekimoto s.n., collected on Mt. Takeyama, in the province of Simotuke, Honshu, Japan, sometime in 1931, and is probably deposited in the herbarium of the University of Tokyo. It is known thus far only from the type collection and the only vernacular name recorded for it is "yasyu-inunohige".

ERIOCAULON SELLOVIANUM Kunth

Synonymy: Eriocaulon brevifolium Mart. ex Körn. in Mart., Fl. Bras. 3 (1): 486, in syn. 1863 [not E. brevifolium Klotzsch, 1848, nor Raf., 1840]. Eriocaulon sellowianum var. α Körn. in Mart., Fl. Bras. 3 (1): 486. 1863. Eriocaulon sellowianum var. ϕ Körn. in Mart., Fl. Bras. 3 (1): 486. 1863. Eriocaulon sellowianum Kunth apud Alv. Silv., Fl. Mont. 1: 398. 1928. Eriocaulon sellowianus Kunth apud Angely, Fl. Paran. 16: 51, sphalm. 1960. Eriocaulon sellowiana Kunth ex Moldenke, Résumé Suppl. 3: 32, in syn. 1962.

Additional & emended bibliography: Kunth, Enum. Fl. 3: 545 & 546. 1841; Schlecht., Limnaea 18: 434. 1844; C. Müll. in Walp., Ann. 5: 930 (1860) and 6: 1171. 1861; Körn. in Mart., Fl. Bras. 3 (1): 476, 483, 485—486, & 493, pl. 61, fig. 2. 1863; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 877. 1893; Ruhl. in Engl., Pflanzenreich 13 (4-30): 42, 46, 51, 117, 285, & 287. 1903; Alv. Silv., Fl. Mont. 1: 398. 1928; Stapf, Ind. Lond. 3: 91. 1930; Castell. in Descole, Gen. & Sp. Fl. Argent. 3: 70—72, 75, 81, 85—86, & [103], pl. 16 & 21. 1945; Moldenke, Known Geogr. Distrib. Erioc. 8, 19, 33, & 40. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 877. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 77, 98, 103, & 206. 1949; Moldenke, Phytologia 3: 385. 1950; Angely, Fl. Paran. 10: 5 & 14. 1957; Moldenke, Résumé 89, 116, 123, 218, 286, 292, & 483. 1959; Moldenke, Résumé Suppl. 1: 18. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 877. 1960; Angely, Fl. Paran. 16: 51 (1960) and 17: 24. 1961; Moldenke, Résumé Suppl. 3: 32 (1962) and 8: 2. 1964; Angely, Bibl. Veg. Paran. 196. 1964; Angely, Fl. Anal. Paran., ed. 1, 199. 1965; Moldenke, Résumé Suppl. 13: 3 (1966) and 17: 10. 1968; Moldenke, Phytologia 17: 452 (1968) and 18: 249, 250, 358, & 376. 1969.

Additional illustrations: Körn. in Mart., Fl. Bras. 3 (1): pl. 61, fig. 2. 1863.

The type of this species was collected by Friedrich Sellow (no. 5137) — in whose honor it was named — somewhere in Brazil and is deposited in the herbarium of the Botanisches Museum at Berlin. Sellow s.n. [*Brasilia meridionalis*], in the same herbarium, is a cotype of E. sellowiana var. ♀ of Körnicke; E. brevifolium Mart. is based on Herb. Martius 881, deposited in the herbarium of the Staatssammlung at Munich. Eriocaulon brevifolium Klotzsch is a synonym of what is now called E. klotzschii Moldenke, while E. brevifolium Raf. is E. pellucidum Michx.

It should be mentioned here that Ruhland's monograph (1903) is erroneously dated "1902" by me in my 1950 installment of these notes. In previous publications I recorded E. sellowianum Kunth from Paraguay, but it is possible that all the Paraguayan material will prove to be var. longifolium Moldenke.

Glaziou 20531 has remarkably large and showy flower-heads and does not match well most of the other material seen by me, but it is cited by Ruhland (1903). Two of the Clausen 49 sheets in the Brussels herbarium were originally labeled "47", but this number was apparently later crossed out and "49" substituted. Dusén 7212 is a mixture with Leiothrix flavescens (Bong.) Ruhl., while Widgren 164 is a mixture with E. obtusum Ruhl. Whether this last-mentioned collection was really made from cultivated material is not certain, but one of the labels is inscribed "in hort. bot."

Eriocaulon sellowianum has been found growing in bogs and on campos, at altitudes of 900 to 1200 meters, flowering and fruit-

ing in December and February. Silveira (1928) cites A. Silveira 200 from Minas Gerais. Material has been misidentified and distributed in herbaria as Paepalanthus falcifolius Körn. and P. tessmannii Moldenke. On the other hand, the Hassler 4270, 8885, & 9425, distributed as E. sellowianum, are var. longifolium Moldenke, P. Clausen s.n. [1845] and Lindman A.3055 are E. obtusum Ruhl., and Luetzelburg 6787a is E. paranense Moldenke.

Additional citations: BRAZIL: Brasília: Heringer 6779 (Z). Goiás: Glaziou 20531 (Br, S); Weddell 1628 (Br, N—photo, Z—photo). Minas Gerais: P. Clausen 49 (Br, Br, Br, N), 198 (Br, N); Schwacke 9927 (B), 9977 (B); Stephan s.n. [Congonhas do Campo, 1843] (Br, Br, N—photo, Z—photo); Widgren 330 (Br), 820 [1845] (S, S, W—937188), s.n. (S). Paraná: Dombrowski 82 (Rf), 1265 [Saito 1080; Herb. Inst. Def. Pat. Nat. 9452] (Ac), 2240 [Kuniyoshi 1983] (Ac); Dusén 2302 (S), 2716 (S), 7212, in part (S), s.n. [24.2.1904] (S); Hatschbach 1191 (N), 2057 (N); Mattos 4412 (N); Reitz & Klein 17469 (Ac); Smith & Klein 14932 (W—2451605); Tessmann 3649 (N). Santa Catarina: Reitz 5281 (N); Smith & Klein 13632 (Ac), 13784 (Ac, N). São Paulo: L. Riedel 2301 (B, B, Mu—235, S, Ut—333). State undetermined: Collector undetermined 42 [Herb. Martius 881] (B, Br, M, Mu—233, N, N—photo, Z—photo); J. F. T. Müller 150 (P), 200 (P); J. E. Pohl s.n. [Brasília] (Mu—234); Sellow 5137 (B—type, Br—isotype, N—photo of isotype, Z—photo of isotype), s.n. [Brasília meridionalis] (B, B); Weddell 2702 [Amaroleite] (Br). ARGENTINA: Corrientes: Pedersen 813 (W—2122570). CULTIVATED: Brazil: Widgren 164, in part (S, S). MOUNTED ILLUSTRATIONS: drawings & notes by Körnigke (B, B).

ERIOCAULON SELLOWIANUM var. LONGIFOLIUM Moldenke

Synonymy: Eriocaulon sellowianum var. longifolium Moldenke apud Angely, Fl. Paran. 16: 51, sphalm. 1960.

Bibliography: Moldenke, Phytologia 3: 417. 1951; Angely, Fl. Paran. 10: 14. 1957; Moldenke, Résumé 89, 116, & 483. 1959; Angely, Fl. Paran. 16: 51 (1960) and 17: 24. 1961; Moldenke, Résumé Suppl. 3: 32. 1962; Angely, Bibl. Veg. Paran. 196. 1964; Angely, Fl. Anal. Paran., ed. 1, 199. 1965.

This plant has been collected in swamps and other wet places, flowering and fruiting in April, August, September, and November. Angely & Mattos describe it as "local", with clear-white flowering heads. Material has been misidentified and distributed in herbaria under the designations E. sellowiana Kunth and E. sellowianum Kunth.

Citations: BRAZIL: Goiás: Weddell 2138 (Br—type, N—photo of type, Z—photo of type). Paraná: Angely & Mattos 3774 (Ca—1147391); Dusén 2716 (S), 11094 (S, S), s.n. [24.11.1910] (S). State undetermined: Sellow s.n. (Br). PARAGUAY: Hassler 4270

(Ca—934842, Mi, N, S), 8885 (Ca—930101), 9425 (Ca—930105, S, W—2055378).

ERIOCAULON SENEGALENSE N. E. Br.

Bibliography: N. E. Br. in *Thiselt.-Dyer*, Fl. Trop. Afr. 8: 251. 1901; Ruhl. in Engl., *Pflanzenreich* 13 (4-30): 103, 106, & 287. 1903; Prain, Ind. Kew. Suppl. 3: 70. 1908; H. Lecomte, Bull. Soc. Bot. France 55: 647. 1909; Moldenke, *Known Geogr. Distrib. Erioc.* 20 & 40. 1946; Moldenke, *Known Geogr. Distrib. Verbenac.*, [ed. 2], 111 & 206. 1949; Moldenke, *Résumé* 135 & 483. 1959.

ERIOCAULON SENILE Honda

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Illustrations: Satake in Nakai & Honda, Nov. Fl. Jap. 6: 6 & 32, fig. 11 & 12. 1940; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] pl. 3, fig. 5. 1940; Koyama in Kitamura, Murata, & Koyama, Col. Illustr. Herb. Pl. Japan 3: fig. 122 (2). 1964.

This species is based on K. Mayebara 27, collected at Nisize, in the province of Higo, Kyushu, Japan, in October, 1924, deposited in the herbarium of Tokyo University. The only common name recorded for it is "gomasio-hosikusa". Satake (1940) says "The present species is distinguished from E. parvum Kcke. in having broader leaves with very obtuse and callose apex, and the male calyces deeply 3-lobed." He cites: JAPAN: Honshu: Collector undetermined s.n. [Nobe-mura, 1890]; Itô s.n. [Oct. 1893]. Kyushu: Doi 60 & 61; Kôzuma 23129; Massumune s.n. [Kagosima]; Mayebara 27, 136, & 157; Nakano 23447; Tasiro 28774, s.n. [Nov. 1916], & s.n. [Oct. 1919]; Yasukawa s.n. [Kawanabe]. Shikoku: Watanabe s.n. [Sept. 1894]. RYUKYU ISLAND ARCHIPELAGO: SATSUNAN ISLANDS: Tanegashima: Tasiro s.n. [Oct. 1921].

Citations: WESTERN PACIFIC ISLANDS: JAPAN: Kyushu: Massumune s.n. [Ohsumi, Oct. 23, 1922] (N); Sakata "A" (Z).

ERIOCAULON SENILE f. **PILOSUM** Koyama

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Citations: WESTERN PACIFIC ISLANDS: JAPAN: Kyushu: Sakata "B" (Z—isotype).

ERIOCAULON SEPTANGULARE With.

Additional & emended synonymy: Cespa aquatica Hill, Herb. Brit. 1: pl. 55 [some copies]. 1769. Eriocaulon decangulare Hope, Phil. Trans. Roy. Soc. Lond. 59: 243, pl. 12. 1770 [not E. decangulare L., 1753, nor Michx., 1959, nor Walt., 1788, nor Willd., 1811]. Eriocaulon decangulare Lightf., Fl. Scot., ed. 1, 569—570. 1777. Nasmythia articulata Huds., Fl. Angl., ed. 2, 1: 415. 1778. Eriocaulon decangulare Hill, Brit. Fl. 29. 1799. Eriocaulon decangulare Hull apud J. E. Sm. in Sowerby, Engl. Bot. 11: pl. 733, in syn. 1800. Nasmythia septangularis Mart., Nov. Act. Physico-med. Acad. Caes. Leopold.-Carol. Nat. Cur. 17 (1): 58, pl. 2, fig. 2. 1835. Eriocaulon articulatum (Huds.) Morong, Bull. Torr. Bot. Club 18: 353. 1891. Eriocaulon articulatum Morong apud Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 158. 1902. Eriocaulon aquaticum (Hill) Druce, Pharmaceut. Journ. [London] 83 [ser. 4, 29]: 700. 1909 [not E. aquaticum Sagot, 1863]. Eriocaulon aquaticum Druce apud Prain, Ind. Kew. Suppl. 4, pr. 1, 82, in syn. 1913. Eriocaulon decangulare Huds. ex Moldenke, Résumé Suppl. 1: 17, in syn. 1959. Eriocaulon septemangulare Turner ex Moldenke, Résumé Suppl. 1: 18, in syn. 1959 [not E. septemangulare Auct., in herb.]. Eriocaulon septangulare With. ex Moldenke, Résumé Suppl. 3: 31, in syn. 1962.

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It should be noted here that the E. decangulare L., referred to in the synonymy above, is a valid species, with E. decangulare Michx. as a synonym, but the homonym accredited to Walter is E. compressum Lam. and that accredited to Willdenow is E. humboldtii Kunth; the "E. septemangulare Auct." is a synonym of E. pallidum Michx. In the bibliography above I have included not only references to the true E. septemangulare of the Old World, but also to E. pallidum, of the New World, since these two taxa are regarded as conspecific by so many workers. The Stone (1912) reference is often cited as "1911", but was not actually issued until January 26, 1912; the illustration is of E. pallidum. The illustrations in Smith's work (1910) and in Creevey (1912) are also of E. pallidum. The Erlandsson reference is often cited as "1940", but the page in question was not actually issued until February 25, 1942. The illustration given by Manning (1965) appears to be a combination of an Eriocaulon plant with the flower-head of an Eriophorum.

BOOK REVIEW

G. M. Hocking

"FORTSCHRITTE DER BOTANIK", begründet von Fritz von Wettstein. -
Bd. 29: xii, 380 pp., 8°; 3 figs.; 1967. Bound: DM 69,—;
US \$17.25. Springer-Verlag, Berlin, Heidelberg, New York.

The current volume of "Progress of Botany" shows five sections of the text, each with its own editor (some of whom also contributed chapters): the editors and their areas are: H. Ellenberg for Geobotany; K. Esser for Genetics; H. Merxmüller for Taxonomy; P. Sitte for Anatomy and Morphology; and H. Ziegler for Physiology. Their work was done in collaboration with the botanical societies of Germany, Israel, the Netherlands, and Switzerland. Twenty-five authors have written the various chapters, including three of the editors (Ellenberg, Sitte, Ziegler). - The section on Plant Anatomy and Morphology includes chapters on the morphology and developmental history of the cell, the submicroscopic cytology of fungal cells, and the general morphology of the higher plants, including anatomy. This last chapter reviews findings of the past five years on formation of the shoot and its structure, including the apical meristem, the embryo and germinating plant, growth forms and shoot design, conductive tissue, etc.; and on the leaf development from early stages, leaf design, and leaf anatomy. This chapter like the other chapters of the book ends in a detailed literature listing arranged alphabetically by the author. In the section on systematics or taxonomy, there are two chapters, one on the classification and evolution of seed plants (Spermatophyta), the other on paleobotany. The first of these chapters is one of the longest in the volume, with 67 pages. It has sections on phenetic (ontogenetic) and phylogenetic taxonomy; the methods, documentation, and history of plant taxonomy; the bases of study of relationships (morphology, anatomy, embryology, palynology, phytochemistry and serology, cytology and genetics, crossing experiments and setting up of barriers to same; hybridization; chromosome structure; dysploidy; polyploidy; etc.); the biology of reproduction; ecology and phytogeography; and biometry; origination, evolution, and systematics (origin of seed plants, experimental research on evolution; cultivated plants); and the systematics and taxonomy of seed plants. The bibliography of this chapter is 28 pages long. The gymnosperms and angiosperms are catalogued into the families which are arranged in alphabetic order, with reference to the genera taken up and authors. - This volume gives a thorough review of the topics covered within of course the limitations of space available.

BOOK REVIEWS

Alma L. Moldenke

"BIOLOGY OF THE MYXOMYCETES" by William D. Gray & Constantine J. Alexopoulos, viii & 288 pp., illus., Ronald Press, New York 10016. 1968. \$12.00.

The plasmodial slime-molds with their unique life cycle and life patterns are given a thorough, modern and interesting survey by these well qualified authors. There are approximately 425 known species to date with no close relatives other than links to the Eumycotina. Physiological, experimental, biochemical and ultrastructural aspects are considered as far as is known.

Included are the morphology, dissemination, feeding, division, and germination of the spores, myxamoebae, swarm spores and microcysts; the nuclear cycles with what is known of hybridization and heterokaryosis; the three main types of plasmodia with their development under varying conditions, their regeneration, their locomotion and their protoplasmic streaming; the formation, dormancy, longevity and vitalizing effect of sclerotia; sporulation and the sporophore; laboratory culture and nutrition with formulae; and geographic distribution and ecology.

Throughout the text unanswered questions are indicated as thought lines for future needed studies. There are separate indices for authors, for genera and species, and for subjects. The bibliography has the advantage for the reader of titles for the articles mentioned. The book is fully and well illustrated and lucidly written.

"MOLECULAR GENETICS" by A. Gib De Busk, x & 134 pp., illus., Macmillan Company, New York, New York 10022 & Collier-Macmillan, Ltd., Toronto, Canada. 1968. \$1.95 paperback.

Here is another stimulating and modern book in the fine "Current Concepts in Biology" series. Since the price is so reasonable and the content so valuable, this text should be in the hands of all really interested genetics students on the undergraduate and graduate levels.

The author defines molecular genetics "as the storage, modification, and retrieval of macromolecular information" and recognizes its origins in transmission genetics and biochemical genetics. The book contents deal with DNA and RNA as primary genetic material, genetic transcription of RNA from DNA, translation of messenger RNA into protein and the genetic code; gene-enzyme relationships to biosynthetic pathways; the molecular basis of mutations, their consequences and repair mechanisms; genetic regulation of cellular control systems through enzymes, histones, hormones and RNA; the mode and mechanism of genetic recombination in microorganisms; and fine-structure analysis of

genes within the triplet coding units.

The book closes with suggested prospectives for this field. At the end of each chapter are given short pertinent bibliographies of the experimenters' reports and other expletive material.

"THE PHYSIOLOGICAL ASPECTS OF PHOTOSYNTHESIS" by O. V. S. Heath, x & 310 pp., illus., Stanford University Press, Stanford, California 94305. 1969. \$8.50.

This book is directed to the level and interests of the advanced undergraduate and graduate students, instructors and research workers in botany. It complements the recently published studies of the biochemistry and biophysics of this process based mainly on experiments with unicellular organisms like Chlorella by emphasizing the physiology of this process in the leaves of higher plants. It also shows how the systems studied operate in various environmental conditions, especially those in which the experimental organisms normally exist. Its excellent critical discussions of recent and current research and its historical appraisal of the work and concepts upon which the research is founded will make this book a definitive one for years to come even though much and different advances are anticipated for the very near future.

The photosynthetic system is demonstrated through the structure of the chloroplasts and their pigments and the internal and external diffusion paths. Excellent electron microscopic views are given.

The physiology of this process is discussed through various methods of investigation with isotope markers and quantitative measuring for O_2 output and CO_2 intake, chemical analyses of dry matter, light energy absorption, total energy fixation, corrections for the respiration rate, and interaction of all these factors.

Leaf water content and supply, light, temperature and their compensation points, and light absorption are carefully explained in terms of cell functions. Perhaps the most impressive chapter in the book is No. 9 on "Light quality and duration; stages in photosynthesis postulated from physiological investigations".

There is an excellent bibliography of 338 items which helpfully lists the articles' titles along with the journals. There is also an author index and a subject one.

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SUPPLEMENTARY NOTES ON THE AMERICAN SPECIES OF *ERYTHRINA*. III.

B. A. KRUKOFF¹

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Introduction

My monograph on this group of plants appeared in print in October 1939 (1) and the last supplementary notes were published in November 1943 (5).

Abundant new collections, as well as old collections which had not been seen by me previously but have become available since then, are cited in this paper. These extend our knowledge of certain species previously known from incomplete material. Extensions of ranges are noted for many species; one, E. elenae, which was described as new since 1943, is reviewed; one new species, E. oliviae, is described; and three, E. occidentalis, E. panamensis and E. colombiana, are now placed in synonymy.

No need has arisen to arrange the species in a new order or to rewrite the keys. Since the monograph appeared, only three new species have been described, and three reduced to synonymy. For a list of these, see Appendix I.

Since 1941 I have examined and annotated specimens in 58 herbaria. It is, therefore, safe to assume that few collections of American species of Erythrina have escaped my attention. The exception is Museum d'Histoire Naturelle, Paris which it was not possible to visit in 1968.

Distribution of species has been compiled from 3042 collections examined and cited in my papers on the genus (See Appendix XII). Particular effort has been made to make the records as complete as possible. Instead of borrowing specimens I visited many herbaria in person and examined all the available material. It often happens that not all available specimens are sent on loans and these can be more surely located and examined on the spot. Knowledge of the geographical ranges of species is not only of intrinsic importance but often is of great help in identification.

The data on the chromosome number of various species of Erythrina are probably fairly complete. The records were well searched.

New species of Erythrina are to be expected in the species-group Herbaceae, also possibly in the species-group Edules. It is not likely that any of these will come to light in the United States, the West Indies, or the lowlands of Central and South America. Some new species likely will turn up in the highlands of Central America and Mexico, and from the poorly collected subandean regions of Colombia, Ecuador, Peru and Bolivia.

As regards range extensions and determination of the limits of distribution of various species, new collections from the regions enumerated above (the highlands of Central America and Mexico and the subandean Colombia, Ecuador, Peru and Bolivia) are of particular interest.

Further substantial progress in our knowledge of American Erythrina will probably come largely through application of experimental taxonomic techniques. In order to understand certain entities, especially in the species-groups Corallodendra, Variegatae and Herbaceae, it is essential to grow, study, and experiment with living

material. For more details see "Problems in the American species of Erythrina". One of the best places for experimentation is probably Atkins Garden & Research Laboratory in Cuba which already possesses a good collection of Erythrina and of other woody Leguminosae. Because this place is in the dry tropics, many Erythrina species will flourish there.

In 1969 and 1970 I hope to assemble for farther cytological work freshly collected seeds of a substantial number of those species of which chromosome numbers are not yet known. The genus Erythrina has been intensely studied by cytotaxonomists; however, additional counts will be very helpful.

The genus Erythrina has been studied in greater detail by chemists than any other genus of tropical Leguminosae. The remains of the very extensive collection of Erythrina seeds assembled by me in the thirties from various parts of the world for studies at Merck Sharp & Dohme Laboratories by Dr. Karl Folkers and his co-workers, have been distributed for studies to three chemical laboratories.

Before long new data should be available on Erythrina alkaloids. New collections of seeds of species hitherto not studied chemically, are contemplated.

Problems in the American species of Erythrina

There seems to be no outstanding problem in the species-groups Fuscae, Cristae-galli, Vernae, Speciosae, Edules, Leptorhizae and Cubenses. New species are expected in the Edules as subandean South America is better collected. Fruit and seeds of E. polychaeta, E. breviflora fma. oaxacana and E. montana are still not known and their collection will be of interest.

Insufficient material of species-group Corallo dendra was available to me when I was working on the monograph in 1938/9. In fact even now these species are poorly represented in the herbaria. It is clear that E. peruviana, E. pallida, E. mitis, E. buchii, E. leptopoda, E. elenae, E. eggersii and E. amazonica are sufficiently differentiated and should remain as distinct species. I question what will happen to the poorly understood E. stullis and to the three varieties of E. corallo dendrum when further extensive collections become available and carefully conducted cultural experiments are made.

The species-group Variegatae presents a problem. E. velutina seems to be confined to the drier tropics. It is found in the West Indies, in northern Venezuela and in northern Colombia; on the west coast it reappears in Ecuador and the Galapagos Islands; on the east coast, in the State of Ceara, Brazil and practically throughout southern Brazil. It will be important to ascertain the real nature of E. grisebachii, confined to Cuba, and of E. velutina fma. aurantiaca, known so far only from the island Fernando Noronha and the State of Ceara, Brazil. As is the case with the members of the species-group Corallo dendra, this could be best done by studying cultivated plants of each, grown from seeds side by side. It will also be necessary to reexamine genuine E. velutina as found in Cuba, and very poorly represented in herbaria. I do not exclude the possibility that eventually E. grisebachii may be reduced to a geographic subspecies or a form under E. velutina.

Additional collections of E. flammea, E. polychaeta, two forms of E. breviflora, E. horrida, E. montana, all species of the species-group Corallo dendra, E. goldmanii, E. gibbosa, E. costaricensis and E. cochleata will contribute valuable data of one sort or another to a more complete understanding of these species.

In 1939 I discussed in a tentative way the relationship of the species (1:213-216). It is unfortunate that not much progress has been made on this line of inquiry. By now it is clear that knowledge of the chromosome numbers and study of the wood anatomy are of no assistance on this problem.

The distribution of particular alkaloids in the seeds of various species of Erythrina (and as a short cut the comparative paralysis potency values as determined from the seeds) is helpful in some cases in indicating relationships. However, this information has no bearing on the problem of what species-groups are more primitive. I have no direct and irrefutable evidence, but I still believe that the Corallo dendra and the Herbaceae are relatively modern and they appear to be still in process of differentiation. These two groups, so abundantly represented in America, are manifestly related. I can suggest no reason why the Herbaceae has so far outstripped the other groups as regards number of species. The Herbaceae contain 21 species; the Corallo dendra 10 species and 2 varieties, while eight other species-groups together contain only 20 species and 3 forms.

Comparative study of the wood structure of species of Erythrina

Cozzo (41) studied the comparative wood anatomy of 3 Argentinian species, E. crista-galli ("Seibo"), E. falcata ("Seibo de Jujuy"), and E. dominguezii ("Seibo chaqueno"). This study was made on two authentic wood samples of each species, backed by vouchers. A key is given for separating the three species on anatomical characters of the wood.

Mention has been made in a previous paper (5:633) of a collection of authentic wood samples of Erythrina that I assembled for comparative study concurrently with the seed collection. Unhappily the study of this material was not pursued to a conclusion. I was informed that the similarity in wood structure between many of the species was so great that no taxonomically useful differential characters could be expected to emerge.

I. Fuscae

1. Erythrina glauca Willdenow, Ges. Nat. Freunde Berlin Neue Schr. 3:428.1801.

Chromosome numbers: $2n = 42$, voucher: Otero 428 (Krukoff Herb. 9215) from Puerto Rico; $2n = 42$, voucher not seen: Servico Forestal s.n. (USDA plant introduction number 150390); $2n = 42$, voucher not seen: W. B. Clarke & Co., San Jose, Calif. (BEF 9914-42) from plant cult. in California (6:408).

Cuba: Pinar del Rio: Bro. Leon et al. 19680 (GH); Habana: Bro. Leon 13288 (GH); Las Villas: Atchison 132 (GH); Oriente: Bro. Leon et al. 19090 (GH). Dominican Republic: Jose Js. Jimenez 3764 (US), 4981.

Puerto Rico: Holdridge 193 (A). Guadeloupe: Adrien Questel 4088 (US). Guatemala: Izabal: Steyermark 39705 (F), Jones & Facey 3481. El Salvador: Carlson 1132 (F), 1138 (F); La Libertad: Carlson 298 (F), Allen 7262 (US); La Paz: Allen 7240 (EAP). Honduras: Cortes: L. O. Williams & Molina s.n. (EAP); Camayagua: Valerio Rodriguez 2915 (F), Cox 1104 (EAP); Olancho: Standley 17744 (EAP); El Paraíso: Standley 16551 (F), Molina 5088 (GH), Molina et al. 15686 (F), Carlson 2520 (MICH). Nicaragua: Greenman & Greenman 5765 (M); Zelaya: Long 252 (F), Molina 1970 (F), Salas & Taylor 2860 (EAP); Matagalpa: L. O. Williams et al. 24801 (F); Segovia: Salas & Taylor 2275 (EAP). Costa Rica: Guanacaste: Tarcoles, costa del Pacifico, Mus. Nac. Costa Rica 23387 (CR); Puntarenas: A. Jimenez M. 1676 (F); Heredia: Jorge Leon 1196 (TURIA); Cartago: Cordoba 40 (TURIA), s.n. (Jan. 5, 1952) (EAP), Jorge Leon 4451 (EAP). Panama: Bro. Paul 362 (US), Cotterman & Klawe P-14 (US); Canal Zone: Graham 305 (GH), Stern et al. 3 (GH), Johnston 955 (GH), Tyson 2632 (M); Colon: Allen 4104 (M), 4155 (M). Colombia: Choco: Duke 9825, 10977; Atlántico: Dugand & Jaramillo 2751, L. E. Mora 1396 (COL), Dugand & Garcia-Barriga 02428 (COL), Dugand & Jaramillo 2751; Bolívar: Molina & Barkley 19 Bo1 81 (COL); Duque-Jaramillo 4406-A (COL); Antioquia: Metcalf & Cuatrecasas 30068 (M); Valle: Cuatrecasas 22956 (F), R. van Sneidern 1169 (US); Cundinamarca: Garcia-Barriga 13403 (US); Pinto et al. 579 (COL), Garcia-Barriga 13403; Huila: Cordill. Oriental, alt. 3500 ft., E. L. Little, Jr. 8466 (COL); Amazonas: Fernandez-Perez 6881 (COL) (Rio Loretoyacu), Black 46-8. Ecuador: Guayas: A. J. Gilmartin 816 (US), Camp E-3624, Asplund 7705 (S), 16657 (LL); Los Rios: E. L. Little, Jr. 6441. Peru: Loreto: Antonio Arostegui 49 (F), 61 (F). Venezuela: Croizat 929, Tania 1703 (VEN) (Barinas), J. Velez 2627 (VEN) (Las Piedras, alr. Pto Paez); Zulia: Lasser 2619 (VEN); Lara: Steyermark 55545 (F); Merida: Humbert 26834 (US), Breteler 3243 (RB), E. L. Little, Jr. 15174 (VEN); Carabobo: Alston 5638, LL. Williams 12636 (VEN); Aragua: LL. Williams 12310 (F); Anzoategui: Foster D. Smith 28 (US); Federal District: Herb. Nac. Ven. 50894 (VEN) and 50895 (VEN) (Los Chorrores), Tamayo 1284 (VEN), Aristiguieta 1998 (VEN) (Caracas - Antimano); Monagas: Wurdack & Monachino 39445, Steyermark 61766 (F), 62049 (F), 62149 (F); Bolívar: LL. Williams 12560 (VEN). Guiana: basin of the Courantne River, Forest Dept. 5395. Surinam: Stahel 622 (US), Landsbosh 136, 190. Brazil: Territory Amapa: Egler & Irwin 46681 (IAN) (basin of Rio Jari), Irwin 48782 (IAN) (basin of Rio Oiapoque), J. B. R. J. 57611 (RB) (Macapa), Froes & Black 27645 (IAN) (basin of Rio Araguari); Para: Ledoux 225 (IAN) (Marajo), Pires 609 (Belem, Utinga), Black 48-2950 (IAN) (Igarape Pixuna, Antonio Lemos), Ducke s.n. (Aug. 19, 1913) (PG) (Collares praia), J. B. R. J. 11961 (RB) (Ilha Mexiana), M. Goeldi s.n. (Oct. 14, 1901) (PG), Huber s.n. (June 12, 1908) (PG) (Hort. Bot. Belem), Siqueira s.n. (Aug. 13, 1903) (PG); Amazonas: basin of Rio Madeira, J. B. R. J. 117088 (RB); basin of Rio Solimoes, Ducke s.n. (Sept. 10, 1904) (PG); Territory Guapore: Herb. Bradeanum 27440 (HB), Duarte 7210 (INPA); Piaui: Parnaiba: Lima 42 (IAN); Ceara (cult.): Ducke s.n. (July 3, 1908) (PG); Pernambuco: Ducke & Lima 76 (PERN); Bahia: Belem et al. 1373 (UB), 1375 (UB), 1311 (UB) and 1377 (UB) (Ilheus), H. Veloso 4 (US), 5 (US), Inst. Bot. Sao Paulo 34381 (SP), N. T. Silva 58326 (UB); Minas Geraes: Herb. Vicosa 1591 (VIC), Espirito Santo: basin of Rio Doce: cult. (shade for cacao), J. B. R. J. 63074 (RB); Rio de Janeiro and Guanabara: cult.: J. B. R. J. 867 (RB), 7494 (RB), 44435 (RB), 11898 (RB); Sao Paulo: cult. Inst. Bot. Sao Paulo 48509 (SP) (Campinas).

Local names: Amapola (Dominican Republic); Cambulo (Valle, Colombia); Amaiza (Loreto, Peru).

Distribution: The second most frequently collected species of the genus in the Americas and one of two (the other being E. berteriana) which occurs both in the West Indies and in Central and South America.

In the West Indies it has been collected in Cuba (Pinar del Rio, Habana, Las Villas and Oriente), Jamaica, Dominican Republic, Puerto Rico, Guadeloupe, Martinique, St. Vincent, Tobago and Trinidad.

In Central America it has been collected in Guatemala (Izabal and Jutiapa), El Salvador (La Libertad, La Paz), Honduras (Cortes, Comayagua, Yoro, Olanchito and El Paraíso), Nicaragua (Zelaya, Segovia, Matagalpa, Granada and Rivas), Costa Rica (Guanacaste, Alajuela, Puntarenas, Heredia, Cartago and San José) and Panama (Bocas del Toro, Canal Zone, Colon and Panama).

In South America it has been collected in Colombia (Magdalena, Atlántico, Bolívar, Antioquia, Valle, Cundinamarca, Cauca, Huila and Amazonas), Venezuela (Zulia, Lara, Merida, Carabobo, Apure, Aragua, Federal District, Guárico, Anzoátegui, Monagas, Delta Amacuro and Bolívar), the three Guianas, Ecuador (Guayas and Los Ríos), Peru (Loreto), Brazil (Amapá, Pará, Amazonas, Guaporé, Piauí, Bahia, Pernambuco and Minas Geraes) and Bolivia (El Beni).

In summing up its distribution this species is found in the West Indies and on the continent from Guatemala south into Peruvian, Brazilian and Bolivian Amazonia.

The species is used extensively as a shade for cacao and coffee and its range has been greatly extended by this use. As a result it is often difficult to ascertain whether the tree is indigenous to certain localities or escaped from cultivation. It is a lowland species, although some specimens from Colombia, Venezuela, and Guatemala are said to have been collected at altitudes of 800 to 1200 meters.

Specimens from trees in cultivation were seen from Belize, Guatemala (Escuintla), Brazil (Ceará, Bahia, Espírito Santo, Rio de Janeiro, Guanábara and São Paulo), Ceylon and the Cameroons (West Africa).

II. *Cristae-galli*

2. *Erythrina crista-galli* L. Mant. 99. 1767.

Chromosome numbers: $2n = 40$, 44 (Tschechow, W. and Kartaschova, *Cytologia* 3:221-249. 1932); $2n = 42$, voucher: Rawitscher s.n. (Krukoff Herb. 9952) from Brazil, São Paulo; $2n = 42$, voucher not seen: McClintock from a plant cultivated in California (I accept the identification of this plant by McClintock without any reservations as she knew this species, as evidenced by her paper (44:57)); $2n = 42$, voucher not seen: Servicio Forestal s.n. (USDA plant introduction number 150388) from Brazil; $2n = 42$, voucher not seen: Henry A. Dreer s.n. (BEF 1194-35); $2n = 42$, voucher not seen: BEF 7-38 from Montevideo, Uruguay (6:408).

U.S.: California: Bracelin 1406 (F), 1485, 1486 (F) (Berkeley), Klawe 1572 (US) (San Diego); Illinois: Chicago, Garfield Park, Ohlendorf s.n. (July, 1890) (F); Pennsylvania: Philadelphia, Kilvington s.n. (US); Washington, D. C., Botanical Garden, Rose 1180 (US); Missouri: Kammerer s.n. (Oct. 2, 1946); South Carolina: Clemson College, Anderson 1526 (US); Georgia: Savannah: Bachus s.n. (May 16, 1927) (F), Bisset s.n. (May 16, 1927) (US), Mississippi: Clarkson s.n. (1937) (F). Cuba: Habana: Bro. Leon 16948 (GH). Dominican Republic: J. J. Jiménez 3050 (US). Guatemala: Alta Verapaz: Molina & Molina 12357 (F). Costa Rica: J. Leon 300 (F), Solis Rojas 270 (M), Mus. Nac. Costa Rica 24046 (C.R.); San José: Mus. Nac. Costa Rica 24553

(CR) and 26868 (CR) (Desamparados), 34219 (CR) (Escazu), 25483 (CR); Alajuela: Mus. Nac. Costa Rica 25236 (CR). Brazil: Minas Geraes: Herringer 3536 (UB), 7127 (UB), Inst. Bot. Sao Paulo 48485 (SP) (Pocos de Caldas), 79560 (SP) (Lagoa Dourada); Rio de Janeiro and Guanabara: Goes & Constantino 238, J. B. R. J. 124185 (RB) (Passo Fundo), Pabst 7131 (HB) (entre Florianopolis y Quatis), J. B. R. J. 112779 (RB) and 112781 (RB) (Horto Florestal, cult.), 11434 (RB) and 77922 (RB) (cult.); Sao Paulo: Rodriguez 3356 (M), de Paiva Coelho 2383 (M), J. B. R. J. 13378 (RB), 69956 (RB) (Rio Bracacaba), 17255 (RB) (Lorena), Inst. Bot. Sao Paulo 28329 (SP) (Rio Jaguar), 51750 (SP) (Salto), 19317 (SP) (Pauso Alegre), 13441 (SP) (Jundiha), Inst. Bot. Sao Paulo 65866 (SP), Pickel 5005 (PERN) (cult.); Parana: J. B. R. J. 29174 (RB) and 59409 (RB) (Palmyra), 29175 (RB) (Sao Matheus), Inst. Bot. Sao Paulo 58286 (SP) (Piraquara), Hatschbach 12023 (F), Gurgel 19; Santa Catarina: J. B. R. J. 53914 (RB) (Nova Teutonia), 73403 (RB) (prope Laguna), L. B. Smith & Klein 8142 (US), Reitz & Klein 9397 (US); Rio Grande do Sul: Pereira 8680 (HB), Rambo 35491 (M), 44550 (M), 49155 (D), Inst. Bot. Sao Paulo 46574 (SP) (Sao Leopoldo). Paraguay: Hassler 1054, 9335. Argentina: Jujuy: Araque & Barkley s.n. (Nov. 28, 1949); Tucuman: Schreiter 775, 61296 (US); Santiago del Estero: Musset 103 (GH); Misiones: Spegazzini s.n. (Jan. 10, 1907) (A); Corrientes: Pedersen 3008 (M), 4798, Lourteig 820, Ybarrola 2928 (M); Buenos Aires: Rodriguez V. 525.

Distribution: The fourth most frequently collected species of the genus in the Americas and by far the most frequently cultivated outside of its natural range.

Attention is called to the fact that all specimens from the West Indies, North and Central America and Peru are from cultivated plants, the species not being indigenous to these countries.

Known native from eastern Brazil, eastern Bolivia, Paraguay, northern Argentina and Uruguay. The specimens seen from the following states and provinces: Brazil (Maranhao, Minas Geraes, Rio de Janeiro, Guanabara, Sao Paulo, Parana, Santa Catharina and Rio Grande do Sul), Bolivia, Paraguay, Argentina (Jujuy, Tucuman, Santiago del Estero, Chaco, Santa Fe, Misiones, Corrientes, Entre Rios and Buenos Aires) and Uruguay.

Specimens from trees in cultivation were seen from U.S.A. (California, Missouri, Kentucky, Mississippi, Georgia and Florida), Bermuda, Cuba, Jamaica, Guadeloupe, Martinique, Trinidad, Guatemala, Costa Rica, Peru, Guiana, Africa and Australia. The species is also often grown in greenhouses in Europe and in the U.S.A. and in botanical gardens in the tropics.

In one of my previous papers I discuss *E. x bidwillii* (*E. herbacea* x *E. crista-galli* (1:232). Three additional specimens of this hybrid were examined: China: Canton: Dahlstrom 519 (1/2-1951) (S), Levine s.n. (Herb. Canton Christian College 1761 (A); Honolulu: coll. undesign. s.n. (June 1927) (S).

On December 28, 1942 *E. crista-galli* was declared a National Flower of Argentina, and in 1967 "*Erythrina*, the Coral tree" was dedicated as the official tree for the City of Los Angeles.

Cavio published a paper (42) dealing with "anomalias en el androceo" in this species particularly in the number of stamens, and in anther arrangement and structure. He mentions that more or less similar anomalies were reported for *E. herbacea* (Penzig, O. Pflanzen-teratologie systematisch geordnet, Berlin 1921-1922). In the monograph, under *E. americana*, I stated: *E. enneandra* was described on the basis of a plant of unknown origin cultivated in Hort. Bot. Monsp. I have seen the type and it manifestly belongs

with *E. americana*. The absence of the tenth stamen in flowers on the specimen in my opinion has no consequence. I have seen obviously abnormal flowers in specimens of at least two species of *Erythrina* with 9 and 11 stamens".

3. *Erythrina falcata* Benth in Martius. Fl. Bras. 15(1):172. 1859.

Chromosome numbers: $2n = 42$, voucher: Silva s.n. (Krukoff Herb. 15062) from Brazil; $2n = 42$, voucher not seen: Servico Forestal s.n. (USDA plant introduction number 150389) from Brazil (6:408).

Peru: Cook & Gilbert 768 (US); Cuzco: Urubamba: Ellenberg 879 (U); Junin: Soukoup 2285 (F); Madre de Dios, C. Vargas C. 14672 (US). Brazil: Bertha Lutz 16 (R), 1689 (R); Minas Geraes: Duarte 251, Mello Barreto 11205 (BHM), Herlinger 3486 (HB), Beoncini 1045 (R), Herb. Vicosa 2228 (VIC), J.B.R.J. 111902 (RB), 111903 (RB) and J. G. Kuhlmann 2228 (US) (Vicosa); Inst. Bot. Sao Paulo 37449 (SP) and 37552 (SP) (Belo Horizonte); Inst. Bot. Sao Paulo 45876 (SP) and J.B.R.J. 45636 (RB) (Estac. Exper. Coronel Pacheco); Inst. Bot. Sao Paulo 37553 (SP) and 37678 (SP) (Tombas); Mendes Magalhaes 655 (BHM), s.n. (Sept. 27, 1941) (IAN) (munic. de Betim, Ibirete), J. Evangelista de Oliveira 591 (IAN) (munic. Santa Luzia), J.B.R.J. 88694 (RB) (Faz do Rasgao, Paraopeba), Duarte & Castellanos 251 (RB); Rio de Janeiro and Guanabara: J.B.R.J. 43332 (RB) and 80782 (RB) (Serra dos Orgaos); J.B.R.J. 50472 (RB) (Petrópolis), Dionisio & Octavio 64, Brade 16406, J.B.R.J. 43613 (RB) and 77924 (RB) (cult.); Sao Paulo: Pickel 5002 (PERN), J.B.R.J. 17258 (RB) (Lorena), Inst. Bot. Sao Paulo 50145 (SP) (amparo), 59664 (SP), 733 (SP) (Butantan), 44443 (SP) (Jard. Bot. cult.), 65865 (SP) (Parque do Estado, cult.), Pickel 3526 (M); Parana: Lindeman & de Haas 2753 (U), 2259 (U), 3340 (U), 5612 (U), J.B.R.J. 115698 (RB) (50 km de Curitiba); Santa Catarina: J.B.R.J. 72796 (RB) (Tijucas), 112782 (RB) (Santa Luzia), Reitz & Klein 7211, 7487, Reitz 2230 (US), J.G. Kuhlmann s.n. (J.B.R.J. 72796); Rio Grande do Sul: Rambo 43871 (US). Argentina: Salta: Meyer 2534 (GH), Schreiter 10625 (US), 11438; Tucuman: Meyer 12643 (M); Misiones: Rojas s.n. (Sept. 2, 1922) (A). Bolivia: Cochabamba: cult. (alt. 2560 m), Cardenas 2404 (US) (fl. red, "Chilicchi"), 2417 (US) (fl. white, "Ceibo blanco"). Australia: Brisbane Bot. Garden, A. Bolin s.n. (Oct. 1967) (cult.).

Local names: Suina and Mochocho (Sao Paulo, Brazil).

Distribution: Subandean southern Peru (Junin, Cuzco and Madre de Dios) and Bolivia (La Paz and Cochabamba), eastern Brazil (Maranhao, Minas Geraes, Rio de Janeiro, Guanabara, Sao Paulo, Parana, Santa Catarina and Rio Grande do Sul), Paraguay and northern Argentina (Jujuy, Salta, Tucuman, Santa Fe and Misiones).

Cultivated in Argentina (Buenos Aires) and a favorite street tree in Sorata, Province of Larecaja, Dept. of La Paz, Bolivia.

III. Vernae

4. *Erythrina poeppigiana* (Walpers) O.F. Cook, Bull. U.S. Dept. Agr. Bot. 25:57. 1901.

Cuba: Las Villas: Gonzales 600, M. Lopez F. 1981 (US). Jamaica: Proctor 11885 (A). Dominican Republic: Jose Js. Jimenez 1622 (US). Puerto Rico: N. Almeyda s.n., E. L. Little, Jr. 13534 (F). Guatemala: Alta Verapaz: Steyermark 44843 (US); Santa Rosa: Standley 78078 (F). El Salvador: Ahuachapan: Standley & Padilla 2798 (F); Santa Ana: Allen & Garcia 7215 (US). Honduras: Morazan: Molina 2707 (GH), Standley 16006 (F), 25844 (F). Colombia: Magdalena: Oscar Haught 4028 (US) (alt. 200 m); Norte de Santander: Cuatrecasas 13004 (US) (alt. 600-830 m); Valle: Cuatrecasas 44504 (US)

(alt. 1000 m), 11563 (US), 16136 (F), 23018 (US) (alt. 950 m); Cundinamarca: Duque-Jaramillo 2217 (COL) (1750-2080 m); Garcia-Barriga 11906 (US) (alt. 1660 m); Meta: Allen 3328 (M) (alt. 600 m); Cauca: Idrobo-Fernandez 207 (US) (alt. 1110 m); Huila: Schultes & Villarreal 5100 (COL) (1300 m), E. L. Little, Jr. 7456 (US) (alt. \pm 1000 m); Marino: J. A. Ewan 15964 (US); Putumayo: T. A. Sprague 380 (US), Schultes & Smith 2080 (GH), Cuatrecasas 11013 (US); (alt. 400 m). Ecuador: Santiago-Zamora: Harling 1132 (S) (alt. 600 m); Esmeraldas: Asplund 16556; Los Rios: Acosta Solis 10735 (F), E. L. Little, Jr. 98257 (F); El Oro: Steysmark 53780 (M); Napo-Pastaza: Asplund 10218 (US). Peru: Woytkowski 34398 (F); San Martin: Ramon Ferreira 4569 (US); Loreto: Woytkowski 308 (M), Ramon Ferreira s.n. (1958) (US). Venezuela: Saers 839 (VEN), Bernardi s.n., Tanayo s.n. (F), Bro. Elias 139b (F), L. Williams 9968 (US); Lara: Steysmark 55550 (F); Trujillo: Steysmark 55852 (F) (alt. 1065-1220 m); Tachira: Alston 7066; Yaracuy: Curran 229, Burkart 16390 (VEN); Miranda: Bernardi s.n. (Nov. 21, 1956), Aristiguieta 1999 (VEN); Anzoategui: Steysmark 61182 (F), 61502 (F); Monagas: Steysmark 62169 (F) (alt. 850 m), Foster D. Smith 214 (US); Zulia: Lesser 2529 (VEN); Sucre: cult. in cacao plantation, Steysmark 95132 (VEN); Merida: E. L. Little, Jr. 15586 (VEN), 15587 (VEN) (cult.), 15792 (VEN) (alt. 1800 m), Aristiguieta 5270 (VEN); Federal District: Pittier 14392 (VEN). Brazil: Amazonas: Boca do Acre, Prence et al. 2385; Territory Roraima: Rio Branco, Vasconcellos D. Coelho s.n. (INPA 10990); Bahia: cult., H. Veloso 2 (US); Sao Paulo: J. E. S. P. 32471 (SP) (Fazenda Santa Eliza, cult.), 59865 (SP) (Jard. Bot. Sao Paulo, cult.). Bolivia: Yungas: Kelly 1023 (A).

Local names: Cachingo (Huila, Colombia); Pu-ru-to-kaspi (a "bean tree"-by Indians in Putumayo, Colombia); Chucho or Rojizo or Peonia (Colombia).

Distribution: This is the fifth most frequently collected species of the genus in the Americas and by far the most frequently grown as a shade for coffee and cacao.

Attention is called to the fact that *E. poeppigiana* is not indigenous to the West Indies or to Central America. All specimens from those regions are either from cultivated plants or from escapes.

Known native in western South America from Venezuela and Panama (southern Darien) in the north throughout subandean Colombia, Ecuador, Peru and Bolivia, and in western portions of Peruvian, Brazilian and Bolivian Amazonia.

Specimens were seen from the following countries: Cuba (Habana, Mantanzas, Las Villas and Oriente), Jamaica, Haiti, Dominican Republic, Puerto Rico, Guadeloupe, Martinique, Trinidad, Tobago, Guatemala (Alta Verapaz and Santa Rosa), El Salvador (Ahuachapan, Santa Ana and San Salvador), Honduras (Atlantida and Morazan), Nicaragua (Managua), Costa Rica (Limon, San Jose and Cartago), Panama (Canal Zone), Colombia (Norte de Santander, Boyaca, Caldas, Valle, Tolima, Cundinamarca, Meta, Cauca, Huila, Marino, Putumayo and Caqueta), Venezuela (Zulia, Falcon, Lara, Merida, Trujillo, Tachira, Yuracuy, Carabobo, Federal District, Miranda, Sucre, Anzoategui, Monagas and Bolivar), Ecuador (Esmeraldas, Los Rios, El Oro, Napo-Pastaza and Santiago-Zamora), Peru (San Martin, Loreto, Huanuco and Cuzco), Surinam (cultivated), Brazil (Territory of Acre) and Bolivia (El Beni and La Paz).

5. *Erythrina ulai* Harms, Verh. Bot. Ver. Brand. 48:172. 1907.

Ecuador: H. G. Barclay 4976 (COL); Napo-Pastaza: Asplund 9258 (US). Colombia: Schultes 3501 (GH) (Rio San Miguel o Sucumbios). Peru: Huanuco: Asplund 12624 (US); Junin: Hutchinson 1202 (US) (Cl. Aug.) (alt. 800 m). Brazil: Amazonas: basin of Rio Jurua, Cruzeiro do Sul, Eroes 21691 (IAM); Maranhao: near Carolina, Pires & Black 1583.

Distribution: Peru (Loreto, Huanuco, Junin and Cuzco), Colombia, Ecuador (Napo-Pastaza), Bolivia (La Paz and Cochabamba) and Brazil (Amazonas, Para and Maranhao). Specimens from Bolivia were obtained at elevations of 500-1600 m.

6. Erythrina dominguezii Hassler, Physis 6:123. 1922.

Chromosome numbers: $2n = 42$, voucher: Schulz s.n. (Krukoff Herb. 15126) from Argentina, Chaco (6:408).

Bolivia: La Paz: cult. in Coroico, Isabel Kelly 1039 (F). Paraguay: Pavetti Morin 1516 (MICH). Argentina: Salta: Schreiter 5025 (F); Jujuy: Ledesma, Cabrera & Fabus 15970 (MUN).

Distribution: Western central Brazil (Mato Grosso), eastern Bolivia (Santa Cruz), Paraguay and northern Argentina (Jujuy, Salta, Formosa and Chaco).

A specimen was seen from a tree cultivated at Sao Paulo, Brazil.

7. Erythrina verna Vellozo Fl. Flum. 304. 1825.

Chromosome numbers: $2n = 42$, voucher: Krukoff Herb. 17932 from Brazil (6:409).

Brazil: Bahia: Cruz das Almas (cult.), J. B. R. J. 132218 (RB); Minas Geraes: J. B. R. J. 71798, Macedo 1141 (M), J. Evangelista de Oliveira 1095 (IAN), Inst. Bot. Sao Paulo 47424 (SP) (Piau), 45877 (SP) (Estac. Exper. Coronel Pacheco), J. B. R. J. 45635 (RB) (Estac. Exper. Coronel Pacheco, Herringer 7698 (UB), J. Evangelista de Oliveira 603 (BHMG) (cult.); Goias: Duarte 10578 (HB), Sidney 193 (UB); Rio de Janeiro and Guanabara: J. B. R. J. 2751 (RB) (Sta Maria Magdalena), 38067 (RB), also 15379 (RB), 47960 (RB) and 111999 (RB) from cultivated plants; Sao Paulo (cult.): Pickel 2133 (M), 5000 (PERN).

Distribution: Central and southern Brazil (Maranhao, Bahia, Territory of Acre, Goyaz, Minas Geraes, Rio de Janeiro, Guanabara and Sao Paulo). Doubtless occurs also in Mato Grosso, Brazil, also in Peru and Bolivia adjacent to the Territory of Acre.

On the label of Inst. Bot. Sao Paulo 47424 is stated: "Mulungu de flor branca. Flores quasi brancas".

The local name "Mulungu" has been recorded for 6 of 12 species of Erythrina which are found in Brazil, (E. poeppigiana, E. ulei, E. verna, E. speciosa, E. amazonica and E. velutina). In this connection it is interesting to note that according to E. G. Baker the local name for E. excelsa Baker (= E. bagshawei Bak. fil.), native to Uganda, East Africa is "Murungu" (39:369).

8. Erythrina flammea Herzog, Repert. Nov. Sp. 7:57. 1909.

Bolivia: Santa Cruz (Buena Vista): Herzog 72 (Z, type).

Herzog states on the label: "Haufiger Baum in der Waldern bei Buena Vista, ca. 400 m, Oct. 1907". This species is known from 6 collections and additional ones would be of considerable interest.

Distribution: Eastern Bolivia (Santa Cruz) and adjacent Brazil (Mato Grosso).

IV. Speciosae

9. Erythrina speciosa Andrews, Bot. Repos. 7: pl. 443. 1806.

Chromosome numbers: $2n = 42$, voucher: Cabral s.n. (Krukoff Herb. 16666) from Brazil, Sao Paulo (6:409).

Brazil: Bahia: Veloso 3 (US), Belem & Magalhaes 1092 (UB) (rodovia Rio Branco-Itabuna, plantacao de cacao), M. T. Silva 58369 (UB); Minas Geraes:

Belem 1612 (UB), Mendes Magalhaes 690 (UB), Herb. Vicosa 1566 (VIC); Munic. Belo Horizonte (cult.), J. Evangelista de Olivenca 1091 (IAN); Distrito Federal: Irwin et al. 8428 (UB), Herringer s.n. (UB); Espirito Santo: Belem 1572 (UB); Rio de Janeiro and Guanabara: restinga de Tijuca, J.B.R.J. 75730 (RB); Petropolis, J.B.R.J. 50471 (RB) and 62394 (RB); Jacarepagua, J.B.R.J. 46980 (RB), 107021 (RB) and 109671 (RB); Horto Florestal (cult.), J.B.R.J. 81427 (RB) and 111900 (RB); Jard Bot. (cult.), J.B.R.J. 17959 (RB) and 90487 (RB); Horto Museu Nac. (cult.), J.B.R.J. 111215 (RB); pr. Passeia Tres, Herb. Bradeanum 34312 (HB); Sao Paulo: Pickel 1892 (PERN); Jorena, J.B.R.J. 17256 (RB); Parque do Estado, Inst. Bot. Sao Paulo 65858 (SP); Campinas, Fazenda Santa Elisa (cult.), Inst. Bot. Sao Paulo 18500 (SP); Inst. Bot. Sao Paulo 38535 (SP) (cult.); Parana: G. Hatschbach 6212 (US); coastal plain, Lindeman & de Haas 2633 (U); Santa Catarina: Reitz & Klein 3533, 8970.

Distribution: Southeastern Brazil (Bahia, Minas Geraes, Distrito Federal, Espirito Santo, Rio de Janeiro, Guanabara, Sao Paulo, Parana and Santa Catarina).

Specimens were seen taken from trees in cultivation in Costa Rica (Turrialba) and Peru.

A striking small tree and a good addition to tropical arboreta.

10. Erythrina polychaeta Harms, Notizbl. Bot. Gart. Berlin 9:295. 1925. Ecuador: Bolivar: Acosta Solis 5847 (F) (alt. 1800 m), 6847 (F) (alt. 2600-3000 m) (Cord. Occident., Salaya).

Local names: Poroto or Hortiga de montana (Ecuador).

Distribution: Known only from 4 collections from central Ecuador (Los Rios, Bolivar and Chimborazo). Specimens were obtained at an elevation of 1800-3000 m.

Fruits and seeds of this species not seen, presumably resembling those of the related species, E. edulis and E. schimppii. Additional collections of this species, especially in fruit, would be of interest.

11. Erythrina schimppii Diels, Bibl. Bot. 116:96. 1937. Ecuador: Guayas: Camp E-3746 (alt. 333-400 m); Bolivar: Acosta Solis 6368 (F) (alt. 800-1100 m), 6498 (alt. 800 m) (F); Los Rios: Asplund 5533 (S), Fagerlind & Wibom 2641 (S), Harling 287 (S); Cotopaxi: Sparre 17149 (S).

Distribution: Known only from Ecuador (Guayas, Pichincha, Tungurahua, Los Rios, Cotopaxi, Bolivar and Chimborazo). Specimens were obtained at an elevation of 270-1600 m.

V. Edules

12. Erythrina edulis Triana; M. Micheli, Jour. de Bot. 6:145. 1892. Venezuela: Tachira: Steyermark & Dunsterville 101,274 (alt. 2000-2400 m). Colombia: Karsten s.n., E. L. Little, Jr. 7421; Magdalena: Kernan 108 (US) (alt. 1480 m); Norte de Santander: Cuatrecasas 12878 (US) (alt. 1200-1500 m); Antioquia: Bro. Daniel 233 (US), J. Araque M. & F. A. Barkley s.n. (Jan. 21, 1949) (US) (alt. 2700 m), Hodge 6826 (US); Medellin, Sandeman 5534 A (COL) (alt. 2333 m), Bro. Daniel s.n. (COL); Valle: Dryander 122 (M) (1400 m), Cuatrecasas 15429 (US) (alt. 1250-1400 m); Cundinamarca: Garcia-Barriga 12495 (US) (alt. 1650-1820 m), Fernandez & Mora 1457 (US) (alt. 2080 m), R. E. Schultes 6599A (US), Duque 492 (COL) (alt. ± 1800 m), Duque-Jaranillo 3369 (COL) (alt. ± 2600 m), Garcia-Barriga 12414 (COL) (alt. 1150-1400 m), Cuatrecasas 13557 (COL) (alt. 2230-2300 m); Cauca: Dryander 2114 (US) (alt. 2300 m), Fosberg 20477 (US) (alt. 1800 m), Kjelf von Sneidern 5620 (US), Cuatrecasas 19504 (A) (alt. 1780-1900 m), H. G. Barclay 5200

(COL); Huila: Cordill. Orient., (alt. \pm 2300 m), E. L. Little, Jr. 8047 (COL), Romero-Castaneda 6573 (COL) (alt. 1600-1700 m); Putumayo, Valle de Sibundoy, Bristol 598 (COL) (alt. 2200 m), Cuatrecasas 11150 (US) (alt. 1600-1800 m), P. Fray Miguel 65 (F) (alt. 2250-2400 m). Ecuador: Coto-paxi: Mathias & Taylor 5187 (LA), Sparre 17327 (S); Esmeraldas: E. L. Little, Jr. 96753 (F); Guayas: Fagerlind & Wibom 657 (S), Camp E-3643 (alt. 333-417 m); Pichincha: Sparre 17050 (S) (alt. 2200 m), Asplund 16705 (LL) (alt. 2550 m), Casalet & Pennington 5030, Acosta-Solis 10910 (F) (alt. 800 m), Carlos Jativa & Carl Epling 559 (LA) (alt. 300-400 m); Tungurahua: Asplund 8020 (US) (alt. 2500 m); Los Rios: Carlos Jativa & Carl Epling 89 (LA) (alt. 70 m); Bolivar: Acosta Solis 6732 (F) (alt. 2000-2600 m), 6833 (F) (alt. 2600-3000 m); Chimborazo: Acosta Solis 5219 (F) (alt. 600 m), 5225 (F) (as to leaves), 5592 (F) (alt. 2500 m), 13957 (F) (alt. \pm 300 m), Wiggins 11061; El Oro: Steyermark 53780 (F) (alt. 2135-2285 m); Azuay: Steyermark 52929 (F) (alt. 1645-2315 m), Camp E-537, E-2198, E-4403; Loja: Sparre 18861 (S) (alt. 2000 m), Harling 6040 (S), Wiggins 10883, Asplund 18033 (R); Napo-Postaza: Harling 3921 (S). Peru: Cajamarca: Woytkowski 6975 (F) (alt. 2700 m); Amazonas: Hutchison & Wright 3871 (LA), 6831 (LA) (alt. 1750-1850 m); Woytkowski 8118 (F) (alt. 1600 m); Loreto: L. Williams 4178 (F); Pasco: Soukup 3307 (US) (alt. 1700 m); Cuzco: Vargas 2801 (M). Local names: Poroto-hortiga or Poroton or Sacha-Poroto (Bolivar, Ecuador). Poroto de arbol (Chimborazo, Ecuador). Camparote de montana (Azuay, Ecuador).

Distribution: Throughout subandean Colombia (Magdalena, Norte de Santander, Antioquia, Boyaca, Caldas, Valle, Tolima, Cundinamarca, Cauca, Huila and Putumayo), Ecuador (Esmeraldas, Guayas, Pichincha, Tungurahua, Los Rios, Bolivar, Chimborazo, Canar, El Oro, Azuay, Loja and Napo-Postaza), Peru (Cajamarca, Amazonas, Loreto, Ancachs, Huanuco, Pasco, Junin, Ayacucho, Apurimac and Cuzco), also in Venezuela (Tachira) and probably in Bolivia (La Paz).

Largely confined to altitudes from 1000 to 3000 m, although found also at lower elevations. Cultivated extensively throughout its range.

Five collections from Ecuador have leaves grading into E. polychaeta. The leaflets of these collections are bullate but not regularly setose-aculeate as in E. polychaeta (Acosta Solis 6732, Steyermark 52929, 53780, Garcia-Barriga 12414 and Harling 3921).

VI. Leptorhizae

13. Erythrina breviflora De Candolle, Prodr. 2:413. 1825.

Mexico: Lyonnet 880 (US) (valle de Tepeite); Jalisco: Keith Roe et al. 2151 (WIS) (alt. 1800 m), Parcena 617 (MEXU), McVaugh 13166 (US) (alt. 2100-2200 m), 13582 (MEXU) (alt. 2000-2250 m), 11381 (MICH) (Sierra de Caule, alt. 2100 m); Colima: Barcena 459 (MEXU); Michoacan: Ugent & Flores 1742, 6127, Barkley et al. 2703, E. L. Little, Jr. 11101, McVaugh 13210 (MEXU) (alt. 1800 m), Manning & Manning 5310 (GH), King & Soderstrom 5060, 5128; Mexico: Keith Roe et al. 1687 (WIS) (alt. 2000 m), 1764 (WIS) (alt. 1950 m), Matuda et al. 26949 (alt. 1500 m), 31551 (US) (alt. 1500-1900 m), Hinton 527 (US), Miranda 550 (MEXU), Rzedowski s.n. (Sept. 3, 1965) (ENCB) (alt. 2000 m); Morelos: L. Paray 1623 (ENCB), J. Espinosa 364 (ENCB), R. Palacios s.n. (Sept. 24, 1964) (ENCB) (alt. 1900 m), s.n. (Aug. 22, 1964) (ENCB) (alt. 2100 m); Federal District: Miranda 591 (ENCB); Hidalgo: Hinton 11513 (GH), McGorcle & Rowell, Jr. 3454 (MICH), Rowell, Jr. 3223 (MICH).

Distribution: At higher elevations from Jalisco and Guanajuato in the north, throughout Michoacan, Morelos and Mexico to and including Oaxaca in the south (Jalisco, Guanajuato, Colima, Michoacan, Mexico, Morelos, Federal District, Hidalgo and Oaxaca). The range apparently does not overlap those of either fma. petraea or fma. oaxacana.

King & Soderstrom 5060 is the first specimen in fruit seen by me.

Seeds are black and fruits and seeds resemble those described for E. breviflora fma. petraea (1:255).

13a. Erythrina breviflora fma. petraea (Brandeggee) Krukoff, Brittonia 3:255. 1939.

Distribution: Known only from 5 collections of C. A. Purpus from the State of Puebla, Mexico, where it is confined to higher elevations. Its range apparently is distinct from those of typical E. breviflora and E. breviflora fma. oaxacana.

Additional collections of this forma would be of considerable interest.

13b. Erythrina breviflora fma. oaxacana Krukoff, Brittonia 3:256. 1939.

Distribution: Known only from 3 collections from the State of Oaxaca, Mexico, where it is confined to higher elevations (+ 1800 m). Its range apparently is distinct from those of typical E. breviflora and E. breviflora fma. petraea. Fruits and seeds of this form were not seen but presumably resemble those of E. breviflora and E. breviflora fma. petraea.

Additional collections of this forma would be of considerable interest.

14. Erythrina leptorhiza De Candolle, Prodr. 2:413. 1825.

Mexico: Herb. M. Urbina s.n. (March 1883) (MEXU) (Cerro de Cuatpec); San Luis Potosi: McVaugh 12285 (US) (alt. 2350 m); Jalisco: Gregory & Eiten 249 (M), Weintraub & Roller 148 (MICH); Guanajuato: Gilley 135 (MICH); Hidalgo: West H-8 (WIS) (alt. 2550 m), C-17 (WIS) (alt. 2500-2900 m), Matuda 21543 (MEXU); Michoacan: Dressler 1158 (M), E. L. Little, Jr. 11012 (MICH); Mexico: F. Takaki s.n. (May 11, 1958) (ENCB) (alt. 2300 m), Hitchcock & Stanford 7011 (US) (alt. 2833 m), Martinez 15059 (M), Matuda 21094 (MEXU), 26297 (US) (alt. 2400 m), 28275 (US) (alt. 290 m), Hinton 15402 (MICH), Beaman 3360 (US) (alt. 3500 m); Federal District: Lyonett 3246 (US), Salazar s.n. (May) (MEXU), s.n. (June) (MEXU); Morelos: J. Escobedo s.n. (Nov. 13, 1960) (alt. 2270 m), Carlos Dios & Dilio Fuentes s.n. (May 16, 1957) (ENCB); Tlaxcala: R. Galicia 6 (ENCB) (alt. 2200 m), Rzedowski 11 (ENCB), Balls 4826 (US) (alt. 2266 m); Puebla: Sharp 44567 (MICH), Miranda 2762 (MEXU), C. E. Smith, Jr. et al. 3916 (alt. 1800-2200 m).

Distribution: At higher elevations from the States of Jalisco, Guanajuato and Hidalgo in the north to and including Michoacan and Puebla in the south (San Luis Potosi, Jalisco, Guanajuato, Hidalgo, Michoacan, Mexico, Federal District, Morelos, Tlaxcala and Puebla). It appears that its range does not overlap the much more restricted ones of two related species, E. horrida and E. montana.

15. Erythrina horrida De Candolle Prodr. 2:413. 1825.

Local names: Sompanla (district Ixtlan, Oaxaca, Mexico).

Distribution: Endemic to Oaxaca, Mexico, where its range apparently does not overlap those of the two related species, E. leptorhiza and E. montana.

16. Erythrina montana Rose & Standley, Contr. U. S. Nat. Herb. 20:179. 1919.

Mexico: Durango: H. S. Irwin 1246, Johnston 2675 (MICH), Maysilles 7001 (MICH), 8194 (MICH), Waterfall & Wallis 13537 (F) (fl. Aug.); Aguas Calientes: McVaugh 18259 (MICH); Nayarit: McVaugh 16411 (MICH), 16454 (MICH),

Gentry 11017 (MEXU), Feddema 689 (MICH) (alt. \pm 1000 m), 918 (MICH) (alt. 1600-1800 m).

Distribution: Western central Mexico (Sinaloa, Durango, Zacatecas, Aguas, Calientes and Nayarit) where it occurs at higher elevations (1600-2900 m). The range of this species apparently does not overlap those of the two related species, E. leptorhiza and E. horrida.

Mature seeds not seen.

VII. Corallodendra

17. Erythrina peruviana Krukoff, Brittonia 3:262. 1939.

Ecuador: Santiago-Zamora: Mathias & Taylor 5231 (US) (fl. July, no leaves), Sparre 19203 (S) (alt. 800 m); Napo-Pastaza: Asplund 8961 (S) (fl. & fr.).

This is the first collection in fruit. Pods subligneous, \pm 24 cm long, deeply constricted between seeds, many-seeded; seeds scarlet (some with small indistinct blackish markings) without a black line near the hilum. Mathias & Taylor state on the label: "small tree with pink flowers", whereas Sparre's label reads: "flowers deep yellow". Additional collections of this species would be of considerable interest.

Distribution: Known only from 4 collections; one from Peru (Loreto) and three from Ecuador.

18. Erythrina pallida Britton & Rose, Bull. Torrey Club 48:332. 1922.

Chromosome numbers: $2n = 42$, voucher: Wortley s.n. (Krukoff Herb. 9257) from Trinidad (6:409).

Tobago: Hunnewell 19942 (GH). Venezuela: Aristeguieta 4976 (US); Falcon: Paraguaná: franja inferior cerro Sta. Ana, Tamayo 806 (VEN); Lara: Tamayo 3830 (El Eneal, Duaca) (VEN), 3854 (Dpt. Crispo, estacas vivas en los cercos) (VEN), Moreno 10 (VEN), E. L. Little, Jr. 16257 (600 m) (VEN); Miranda: Higuerote (600 m), F. Tamayo 1665 (fl. & fr. Dec. 12, 1963) (VEN); Federal District: cult. at Jard. Bot. in Caracas from seeds received from Lara, Tamayo 1644 (VEN), Aristeguieta 5265 (VEN).

Distribution: St. Vincent, Tobago, Trinidad, Margarita and probably other neighboring islands (?Martinique); also Venezuela (Falcon, Lara, Miranda).

19. Erythrina mitis Jacquin, Hort. Schoenb. 2:47. 1797.

Venezuela: Croizat 474, 938: Trujillo (cult. in hedges): Burkart 16650 (VEN) (fl. Apr.); Yaracuy: Curran 255, Aristiguieta & Foldats 1247 (VEN) (fl. Dec.), 1491 (VEN) (fl. Dec.); Carabobo: Tamayo 2238 (VEN) (fl. Febr.); Bolívar: (?) Elanco 228 (VEN), Marshall Turner 150 (F), Steyermark 88233 (VEN) (fl. Jan. 8) (Altoplano Nuria, alt. 300-500 m), 88666 (VEN) (fl. Jan. 21) (Altoplano Nuria, alt. 230 m); Miranda: Aristiguieta 3804 (VEN) (fl. Jan.) (alt. 200 m), Bernardi 5934 (VEN) (fl. Dec.), s.n. (Nov. 22, 1956), s.n. (Nov. 27, 1956).

Distribution: Venezuela (Trujillo, Yaracuy, Carabobo, Miranda, Federal District and Bolívar).

20. Erythrina buchii Urban, Repert. Sp. Nov. 17:157. 1921.

Chromosome numbers: $2n = 42$, voucher not seen: Holdridge s.n. from Haiti. I accept the identification by Holdridge without reservation as he knew this very distinctive species and collected specimens of it (Holdridge 947) (6:408).

Haiti: Gros Cheval (alt. 1500 m), Holdridge 947.

Distribution: Endemic to Haiti (Massif de La Selle) where it is rather

common at elevations of about 1200 m and is also planted for living fence posts.

21. Erythrina leptopoda Urban & Ekman, Ark. Bot. 20A (5):14. 1926.

Distribution: Endemic to Haiti (Massif de la Selle) where it is common above 700 m and is also planted for living fence-posts.

- 21a. Erythrina elenae Howard & Briggs, Jour. Arn. Arb. 34:183. 1953.

Cuba: Las Villas: R. Howard et al. 377 (A, type, NY, IAN) ("Rocky hill slope $\frac{1}{4}$ mile west of Río San Juan which is crossing road to Trinidad"), Howard 5336 (Trinidad Mts., limestone).

Distribution: Known from 2 collections from Las Villas, Cuba.

The original description is ample. This is one of the most distinctive species in the genus and can be immediately recognized on the vegetative characters (leaves). Although flowers are not yet known I am tentatively placing it in the group Corallodendra. It is doubtless endemic to Cuba. The collectors describe the species as a tree 30 ft. high which has a trunk with spines or corky growths.

Additional collections of this species, especially in flower, would be of considerable interest.

22. Erythrina eppersii Krukoff & Moldenke, Phytologia 1:289. 1938.

Chromosome numbers: $2n = 42$, voucher: Atchison 252 (8/7-47) (US)

(cited as "E. horrida" in 6a:544), from a plant cultivated at the Atkins Garden & Research Laboratory, Soledad, Cienfuegos, Cuba.

Distribution: Puerto Rico and Virgin Islands (Vieques and St. Thomas).

Occasionally planted there as a fence tree.

23. Erythrina amazonica Krukoff, Brittonia 3:270. 1939.

Chromosome numbers: $2n = 84$, voucher: Froes 11842 (Kr. Herb. 15117) from Brazil, Maranhao, Island of Sao Luiz (6:408).

French Guiana: Leblond 198 (1792) (G). Guiana: basin of the Rupununi River, Forest Dept. 5660. Surinam: Tresling 340 (U), Kramer & Hekking 2665 (U). Brazil: Para: Lucke 1655 (F) (flores rosas) (near IRL, 1960(RB) (Rio Branco de Obidos), s.n. (Aug. 5, 1912) (PG) (Rio Branco de Obidos, Matta, Jaussuzal), Pires 1395 (IAN) (Vigia), Silva 170 (IAN) (Vigia, beira do Rio Vigia); Maranhao: Black et al. 54-16575 (IAN) (arbusto; flores roseas), Lucke s.n. (Sept. 25, 1903) (PG) (Alcantara, capoeira), J.B.R.J. 4758 (RB) (Carurupu). Colombia: La Serrania (entre los rios Ariari y Meta, 270 m alt.). Guatrecasas 7816 (US); Michada: Cano Sama: Nicolino Mattar s.n. (July 1947).

Distribution: At low elevations in Colombia (Putumayo), Peru (Loreto), French Guiana, Surinam, Guiana, and Brazil (Amazonas, Para and Maranhao).

All collections in fruit have bicolored seeds (red and black) except for Froes 9515 (from the basin of Rio Pindare, Maranhao) which has seeds uniformly red.

Lucke gives an excellent description of the occurrence of this species in the Brazilian Amazonia: "Arvore pequena, aculeada, com bellas flores cor de coral e entao desfolhada; em estado indubitavelmente espontaneo no "uaussuzal" (matta com predominio da palmeira "uauassu": Orbignyia speciosa) do pequeno Rio Branco ao nordeste de Obidos. Cultivada em Belem e muitas outras partes do Brasil tropical (chamada "mulungu", como as demais especies de flores rubras)."

24. Erythrina similis Krukoff, Brittonia 3:271. 1939.

Distribution: Known only from 3 collections, one each from Brazil (Mato Grosso), Bolivia and Paraguay.

Fruits and seeds not seen. Additional collections of this species would be of interest.

25. Erythrina corallodendrum L. var. corallodendrum, Sp. Pl. 706. 1753.
Jamaica: Yunker 18024 (F), Howard & Proctor 15123 (A), Proctor & Mullings 22038 (GH), Hunnewell 11063 (GH), Powell 979 (MICH). St. John: Woodworth 155 (F). Curacao: cult., Fr. Arnaldo 2084 (US).

Distribution: Jamaica, Haiti and St. John.

Planted in Jamaica as a fence-post.

- 25a. Erythrina corallodendrum var. bicolor Krukoff, Brittonia 3:275. 1939.
Chromosome numbers: $2n = 42$, voucher Ward s.n. (Krukoff Herb. 15202) from St. Lucia (6:408).

St. Kitts: Wingfield Ravine, Proctor 19274 (BR). Antigua: Box 1468 (F, US) (fr. June). Marie Galante: Proctor 20963 (BR). St. Lucia: Pamela Beard 1077 (GH). St. Vincent: Cooley 8450 (GH), Morton 4714 (US). Grenada: Howard 10958 (GH).

Distribution: St. Kitts, Antigua, Montserrat, Guadeloupe, Marie Galante, Dominica, Martinique, St. Lucia, St. Vincent and Grenada.

Additional collections of this entity would be of considerable interest. They may help to demonstrate whether or not it is best treated as a form rather than a variety.

- 25b. Erythrina corallodendrum var. connata Krukoff, Brittonia 3:276. 1939.
St. Thomas: Orsted s.n. (1845-48) (US).

Distribution: St. Thomas, St. Croix and probably other neighboring islands.

Fruits and seeds of this species not seen.

Additional collections are needed to verify whether or not this variety has a distinct geographical range and to check whether or not the color of the seeds is correlated with characters in flowers (connate keel-petals, etc.).

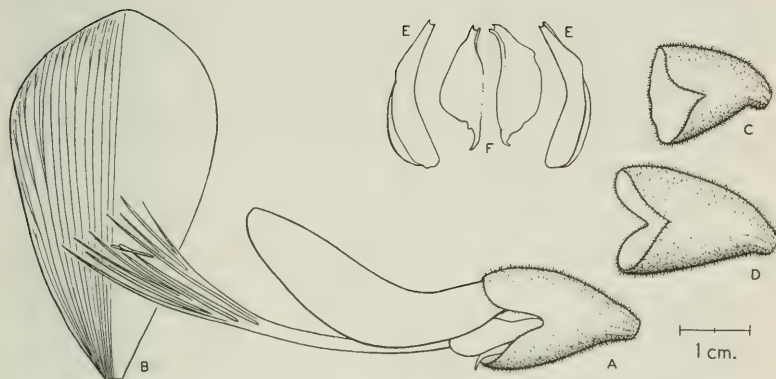
VIII. Cubenses

26. Erythrina cubensis C. Wright, Sauv. Anal. Acad. Ci. Habana 5:336. 1869.
Cuba: Pinar del Rio: Bro. Leon 18073 (GH); Las Villas: Clement 6342 (GH); Oriente: Hno Alain et al 5405 (GH), Bro. Leon 17932 (GH), Bro. Hioram 7270 (GH).

Distribution: Endemic to Cuba (Pinar del Rio, Isla de Pinos, Las Villas and Oriente).

- 26a. Erythrina oliviae Krukoff, sp. nov. inter congeneres calycis campanulati tubo de latere ad medium fisso bilabiato, vexillo late elliptico, carinaeque petalis apice acuminatis praestans.

Arbores mediocres ad anthesin saepissime foliatae, trunco spinis armato, ramulis robustis saepe aculeatis; petioli juniores pubescentes mox glabrati 5.5--14 cm longi espinosi; petioluli 3--7 mm longi 0.5--1 mm diam, ut petioli demum glabrati; foliolorum laminae tenuiter chartaceae juniores ut petioli pubescentes mox glabrae subtus nec spinosae nec ceriferae; foliolum terminale late ovatum vel subrotundum 3.5--8.5 cm longum 3.7--8 cm latum, apice rotundatum vel emarginatum basi late cuneatum vel truncatum, venis secundariis utroque latere saepissime 5 percursum; inflorescentiae rachis pedicellique floriferi non visi; calyx fere 2 cm longus 1.3 cm diam, junior breviter puberulus demum glabratus vel glaberrimus, campanulatus paulo antrorsum curvatus bilabiatus, tubo utroque latere ad medium fere fissus (nonnumquam uno latere integro) labis integerrimis subaequilongis truncato-rotundatis; vexillum arcuato-recurvum elliptico-obovatum valde obtusum haud stipitatum \pm 6 cm longum 2.5 cm latum, ad anthesin (fide collectoris) vivide aurantiaco-bubalinum saturatus lineolatum; alae oblanceolatae



Erythrina oliviae Krukoff

- A. Flower
B. Standard
C, D. Calyxes
E, F. Wings & keel-petals

leviter falcatae fere 2 cm longae 8 mm latae, basi angustatae, apice valde obtusae ultra medium concavae vel involutae carinae paullo longiores; carinae petala \pm 1.8 cm longa 6.5 mm lata inter se secus margines exteriores rectas coadunata, basi in unguiculum \pm 2 mm longum angustata, lamina semi-obovata apice abruptiuscule acuminato-caudata; androecii fere 8 cm longi filamenta per \pm 3 cm inter se libera, antherae lineares \pm 6.5 mm longae; pistillum ad 7.2 cm usque longum, pilis pallidis dense cinereo-pubescentis; pedicelli fructiferi \pm 9 mm longi 2 mm diam; legumen 20--24 cm longum \pm 1.7 cm diam, basi in stipitem \pm 3.5 cm longum, apice in rostrum gracile \pm 2 cm longum contractum, inter semina compluria inaequaliter paulloque constrictum; semina \pm 18 mm longa 8 mm lata, immatura aurantiaco-lutea dein saturate rubra, ventre linea lata nigra de hilo chalazam versus \pm 3 mm longa notata.

Type locality: El Papayo, mpo. de Ahuhuetitla, Puebla, Mexico.

Distribution: Known only from the type locality.

Mexico: Puebla: El Papayo (k. 264 Oaxaca highway, \pm 16 mi. WNW of Acatlan de Osorio, elev. \pm 1300 m), Olivia Converse 134 (lvs., fls., and frs., Apr. 26, 1952, Jan. 3, 1954, Jun. 1962), US, type, NY, isotype; s.n. (lvs., frs., Aug. 19, 1962), NY, US.

The collector's label on Converse 134 reads: "collected from a line of 8 trees, evidently grown from stakes placed for a fence..trees about 10 m high; trunks about 50 cm..tree spiny..the largest leaflets 5.4 x 5.8 cm..inflorescences 18 to 30 cm..standard 9 cm long x 3 cm wide when open, a soft yet vivid orange-buff color, with marked veinings; keel-petals and wings \pm 2.5 cm, bright reddish-orange..fruits 20-24 cm long, very unevenly constricted..seeds 15 x 7 mm, very variable in their shades of buff.."

The collector's label on Converse s.n. reads: "there are many more trees of the same species in the "monte", including one growing by the dry river on opposite side of road from those collected". The species appears to be in flower in April/June.

This is a strongly marked species, without close relatives in the genus best placed in the species-group Cubenses. The combination of small leaflets, irregularly cleft calyx, broad banner, and apically acuminate keel-petals is an unique one. In the material examined the majority of calyces are cleft on one side only, but one calyx is cleft half-way on both sides, becoming 2-lipped in consequence. Examined rapidly, the calyx cleft on only one side suggests the spathaceous calyx of *E. velutina* but there the cleft is situated behind the standard and the orifice of the calyx is strongly oblique. The calyx cleft on both sides suggests that of *E. cubensis*, which also has a rather broad standard, but obtuse, apically unappendaged keel-petals. Keel-petals more or less acute at apex occur in several subgroups of the species-group Herbaceae as defined in the monograph (1), but always associated with a narrower standard and a campanulate or tubular-campanulate calyx entire or minutely undulate-toothed around the orifice. The oblanceolate, obtuse, distally involute wings which are a trifle longer than the keel are suggestive of the Herbaceae, a group highly differentiated in Mexico and Central America, and it seems likely that *E. oliviae* represents a specialized offshoot from this large species-group.

IX. Herbaceae

27. *Erythrina herbacea* L. Sp. Pl. 706. 1753.

Chromosome numbers: $n = 21$, $2n = 42$ (Senn, E.A. Bibliographica Genetica 12:175-336. 1938); $2n = 42$, voucher not seen: Servicio Forestal s.n. (J.S.S.A.).

plant introduction number 150391) (this identification should be verified as I have not seen any specimens of this species cultivated in Brazil); 2n = 42, voucher: White s.n. from Myrtle Beach, South Carolina; 2n = 42, voucher: White s.n. from Holden Beach, North Carolina; 2n = 42, voucher not seen: Lewis & Oliver 523h from Texas, Nacogdoches Co. (Lewis, Walter H. et al., *Rhodora* 64:151, 1962) (6:408, 409).

U.S.: about 80 collections were examined and annotated. They are not cited here as the distribution of this species in the U.S. is well known. Mexico: Troll 228 (MEX); Tamaulipas: Higgins 13352 (D), Kennerly & Crum 3315 (A), R. Merrill King 4509, Viereck 741 (US), Bressler 1878 (MICH), Johnston 5228 (MICH), 5242 (MICH), Barkley & Smith s.n. (Apr. 4, 1917) (F); San Luis Potosi: Rzedowski 6959 (MEXB), Barkley s.n. (Apr. 13, 1917); Hidalgo: Moore 2089 (M); Veracruz: Mario Souza 2277 (MEXU), Bressler & Jones 11, A. Gomez P. & R. Riba 72 (MEXU); Puebla: Miranda 8380 (MEXU); Oaxaca: Alexander 135, L. Gonzales C. s.n. (March 3, 1964) (MEXB).

Distribution: Southeastern U.S. (Texas, Louisiana, Mississippi, Alabama, Georgia, South Carolina and Florida) and eastern Mexico (Tamaulipas, San Luis Potosi, Hidalgo, Veracruz, Puebla and Oaxaca).

I have not seen any specimens of this species from North Carolina. However, a specimen is cited (6:409) as collected by Dr. O. E. White at Holden Beach, Brunswick County.

Specimens from plants in cultivation were seen from Bermuda and Cuba. This is the third most frequently collected species of the genus in the Americas.

In a summary of her paper Atchison (6:413) states: "E. herbacea..contains both herbaceous perennial and arborescent forms. These growth habits are apparently hereditary and at least merit separation into varieties"..

She discusses the species also elsewhere in her paper (6:410-411): "Herbaceous plants transferred to a greenhouse at the Blandy Experimental Farm have kept their normal habit. Perennial and arborescent characters in E. herbacea are probably hereditary and not merely the result of response to climate conditions. Further investigation may prove the two forms worthy of varietal, if not specific separation".

I already discussed the above matter at length back in 1939 in the monograph (1:284): "In the northern portion of its range the species is a perennial herb with a very thick fleshy root, which sends up several stems to about 1 meter high which die every year; the long leafless rachises commonly proceed directly from the root. In tropical Florida and Mexico it becomes a shrub or a small tree up to 6 meters, often with a single stem. I am in agreement with Standley that the shrubby form seems to differ from the typical E. herbacea only in habit and in heavier pubescence of rachises and pedicels and therefore does not merit any taxonomic designation. In this connection it is noteworthy that E. crista-galli, a large tree in its native habitat in South America, dies back to the root every year if grown outdoors in England".

I am not prepared to recognize the arborescent form even as a geographical variety as in Texas and elsewhere occur forms intermediate between the extremes mentioned by Atchison. Furthermore, I do not find any characters for separating any forms treated here as E. herbacea..

Incidentally, as I stated in the monograph (1:284), the first specific name proposed for the shrubby form of E. herbacea appears to be E. rubicunda. Recently I examined the type of it (Herb. Jacq. s.n. (1806), (W).

For information on the more or less similar situation in E. flabelli-

formis, see under that species. On rocky ground and mountain slopes in Arizona the plants are with large roots which send up several shoots, thus forming shrubs about 1 meter high with several stems. In the southern portion of its range in Mexico it becomes a tree.

28. Erythrina coralloides De Candolle, Prodr. 2:413. 1825.

Mexico: Martin 007 (MICH); Nuevo Leon: Meyer & Rogers 2895 (U) (1900 m); San Luis Potosi: Rzedowski 5783 (ENCB), 8737 (ENCB) (alt. 2100 m), 8767 (ENCB) (alt. 1450 m); Guanajuato: Kenoyer 1797 (A), Gilly 137 (MICH); Hidalgo: L. Gonzalez Quintero 2286 (ENCB) (alt. 1900 m); Mexico: Dodds & Simpson 28 (MICH), Bourgeau 1188 (FI), Legro 115 (FI); Federal District: Matuda 21035, Espinosa 668 (ENCB) (cult.); Morelos: Miranda: 9315 (MEXU); Puebla: Merrill King 2280 (MICH), Bro. Arsene s.n. (Aug. 1907) (US), 128a (US) (alt. 2160 m), 2372 (US); Oaxaca: Cox 1623 (EAF).

All specimens of Bro. Arsene are from the vicinity of Puebla.

Distribution: Eastern Mexico (throughout Nuevo Leon, Tamaulipas, San Luis Potosi, Guanajuato, Queretaro, Hidalgo, and in eastern Jalisco, Michoacan, Guerrero, Mexico, Federal District, Morelos, Puebla and Oaxaca).

McClintock (44:53) states: "E. coralloides has been known in California as E. poianthes. This error may perhaps be traced to a color plate in Curtis' Botanical Magazine (No. 3234, published in 1833) labelled E. poianthes. This plate is an excellent representation of the tree, grown in California, and also, surely of E. coralloides, although it apparently has not been assigned to this species. Krukoff, in his revision of the American species of Erythrina (Brittonia 3:205-237. 1939) referred to this plate in his treatment of E. speciosa (= E. poianthes) and did not accept it as representing this species. He however, did not further identify the plate".

My statement to which McClintock refers reads as follows: "I cannot accept the plate (Curtis' Bot. Mag. 60: pl. 3234, 1833), said to be of E. poianthes, as of E. speciosa, as the seeds are shown on the plate as red, and as keel-petals are separate and smaller than wings". It is quite obvious that the plate in question is an excellent representation of E. coralloides except that the keel-petals in this species are connate whereas they are shown to be separate on the plate.

29. Erythrina flabelliformis Kearney, Trans. N.Y. Acad. 14:32. 1894.

Chromosome numbers: $2n = 42$, voucher: Jones s.n. (Krukoff Herb. 9485) from Arizona; $2n = 42$, voucher not seen: BEF 1136-38 (USDA plant introduction number 123862) (inasmuch as these seeds bear the USDA plant introduction number, they must come from a foreign country, probably Mexico where E. flabelliformis is found; if this is the case then the identification should be verified, as this species is often confused with E. coralloides and other species) (6:408).

U.S.: about 45 collections were examined and annotated. They are not cited here as the distribution of this species in the U.S. is well known. Mexico: Lower California: Wiggins 5574 (MICH), J.H. Thomas 7863 (US), Gentry & Fox 11868 (LL), Carter & Ferris 3111 (D), 3437 (D); Sonora: Wiggins 1354 (D), White 507 (MICH), 2761 (MICH), 2813 (MICH), 4097 (MICH), Miller 3654 (MICH), Martin 56077 (MICH), Straw & Forman 1600 (MICH); Chihuahua: Knobloch 1130 (MICH), G. Borja L. B-366 (ENCB); Durango: Lundell 13003 (MICH); Jalisco: Pringle 4011 (MEXU), Gentry & Gilly 10895 (MEXU), McVaugh 14891 (MICH) (fr. June) (ca 10km. SW of Lagos de Moreno, alt. 2000-2100 m), 15093 (MICH), 16811 (MICH) (fr. Aug.) (near Cerro La Campana, alt. 2100-2300 m); Zacatecas: 5 miles NE of Jalpa, alt. 1500 m, McVaugh 18486 (MICH) (fr. Aug.).

Local names: Zumpantla (Jalisco).

Distribution: In southeastern Arizona (counties Pinal, Pima and Cochise) and in southwestern New Mexico (Grant county), U.S., and in western Mexico (throughout Lower California and Sonora, in northern Sinaloa, western Chihuahua, Durango, Zacatecas, central Jalisco and northwestern Michoacan).

This species is a small shrub in Arizona and a tree 5 - 8 m high in the southern part of its range in Mexico (see for example annotations on Carter & Ferris' specimens from Lower California). The plant occurs in Arizona at an elevation of up to 5000 ft.

30. Erythrina lanata Rose, U.S. Dept. Agr. N. Am. Fauna 14:81. 1899.

Erythrina occidentalis Standl. Contr. U.S. Nat. Herb. 20:180. 1919.

Mexico: Sinaloa: Gonzalez Ortega 22 (MEXU), 1194 (MEXU), 5416 (ENCB); Nayarit: Mason 1787 (Tres Marias) (D), Chavez & Villamar s.n. (fl. Jan.) (Isla Maria Madre) (ENCB), Feddema 1049 (MICH), Gentry & Gilly 10717 (LL), McVaugh 12068 (US); Jalisco: Wilbur & Wilbur 1373 (MICH); Colima: Gilly et al. 7 (MICH), McVaugh 15782 (MICH), McVaugh & Koelz 1453 (MICH), 1609 (MICH), Miranda 9083 (MEXU) (fl. Dec.); Mexico: Hinton 10030, H. Bravo H. 3397 (MEXU) (fl. July); Guerrero: Miranda 4329 (MEXU) (fl. March), Kruse 249 (fl. March); Oaxaca: McVaugh 22417 (MICH); Chiapas: Ocozocuantla, Moore 2543 (GH).

Local names: Colorin or Chilicote or Peonia (Sinaloa).

Distribution: Western central and southern Mexico (Sinaloa, Jalisco, Colima, Michoacan, Mexico, Nayarit, Guerrero, Oaxaca and Chiapas).

In the monograph I stated: "E. occidentalis perhaps should not be regarded as specifically distinct from E. lanata. I have retained the name for the time being because the majority of specimens of E. lanata are quite incomplete and were obtained from several widely separated localities, and it is therefore difficult to form a clear concept of the species. The specimens from the State of Sinaloa and Tres Marias Islands, here treated as E. occidentalis, form a compact group with fairly uniform large pods, large seeds, and small thin calyces."

Abundant new collections (including specimens from Sinaloa and Tres Marias Islands) examined and cited in this paper show that E. occidentalis cannot be maintained as a distinct species.

32. Erythrina berteroa Urban, Symb. Ant. 5:370. 1908.

Chromosome numbers: $2n = 42$, voucher: Petersen s.n. (Krukoff Herb. 9705) from Guatemala, Escuintla; $2n = 42$, voucher: Owen Smith s.n. (Krukoff Herb. 9637) from Guatemala, Solola; $2n = 42$, voucher not seen: Walsingham s.n. from Cuba, Atkins Gard. & Research Lab. I accept the identification of this plant by Walsingham without any reservations as he knew this species and he sent me seeds and specimens of it - Krukoff Herb. 9133 (Walsingham s.n.) (6:408); $2n = 42$, voucher: coll. undesign. 254 from Central America (under the name "E. neglecta Krukoff") (6a:544).

Cuba: Isla de Pinos: Morton 10141 (US); Las Villas: Gonzales 473, Howard 4884 (M). Dominican Republic: Allard 13473 (US). Puerto Rico: E. L. Little, Jr. 13771. Mexico: Veracruz: Sierra de Tuxtla, R. F. Andrie 3 (US); Chiapas: Esperanza, Escuintla, Matuda 17601. Guatemala: Alta Verapaz: Steyermark 44270; Zacapa: Steyermark 43322 (F); Retalhuleu: Standley 88031 (F); Suchitepequez: Krukoff 67-3, Steyermark 478C1 (F); Sacatepequez: Breedlove 11407 (US); Escuintla: Standley 89273 (F), 89607 (F); Santa Rosa: Standley 78544 (F). El Salvador: Allen & Armour 6833 (EAP); Ahuachapán: Standley & Padilla 2514 (F); La Libertad: Carlson 93; Morazan: Tucker 799 (F). Honduras: Cortes: Molina 3569; Comayagua: Valerio Rodriguez 2510 (F); Morazan: Pfeifer 1689 (US) (alt. 1000 m), Glassman 1716, Molina 231 (GH),

Standley 16168 (F), Standley & Padilla 1237 (F), 1953 (F), L. O. Williams & Molina 11926 (EAP) (alt. 1100 m); Glancho: Standley 18152 (EAP) (alt. 150-500 m); El Paraíso: Valerio Rodríguez 1906 (F), Molina 858 (F), Standley 16608 (EAP) (alt. 700-800 m), 25789 (EAP) (alt. 930 m). Nicaragua: Esteli: Standley 20349 (EAP) (alt. 680 m); Jinotega: Standley 9519 (F), 10583 (F). Costa Rica: Forsch 755 (G) (near Coyolar, alt. 140 m), Cufodontis 316 (G) (Irazu, alt. 2000 m); Guanacaste: Brenes 823 (G), Dodge & Thomas 6445 (M), Mur. Nac. Costa Rica 26774 (CR) (Sierra de Tilarán), Paul Stark s.n. (EAP) (Aug. 7, 1950) (alt. 255 m); Alajuela: Marañón, alt. 1150 m, Austin Smith 10064 (G); Tarrazo, alt. 1000 ft., Oton Jimenez & Linkaster s.n. (CR), San Carlos 288 (EAP), Jorge Leor 2315 (EAP) (alt. 1500 m); San José: Herb. Pittier 1056 (CR) (alt. 1200 m), Mur. Nac. Costa Rica 26640 (CR) (La Uruca), 30678 (CR) (San Antonio de Bilen, Fuente de Nulas), 30595 (CR) (Hacienda La Trinidad, Montes de Oro); Puntarenas: Palmar 33 (alt. ± 900 m); Cartago: Forsch 216 (W) (alt. ± 2000 m). Panama: Bickel 1504 (US), Stern et al. 290 (H), Ailen 1631 (US); Chiriquí: Stern et al. 1216, Woodson & Schery 151 (CH), Allen 3553 (M), Davidson 735 (US) R. Merrill King 5324 (US); Veraguas: Blum & Eagon 523 (H); Los Santos: Dwyer 2250 (H); Canal Zone: Duke 11737, Harvey 2221 (F), 5225 (F), Dwyer 1237 (H), Blum 542 (H), Stern et al. 251 (H); Darien: Duke 10360. Colombia: Choco: munic. Riosucio, Romero-Castaneda 6109 (COL) (alt. 200 m), Oscar Haught 5449 (US) (alt. 100 m); Magdalena: Romero-Castaneda 842 (COL), 874 (COL), Oscar Haught 1160 (F), Echeverría 331, Rafael Romero C. 843 (US); Guajira: Cuatrecasas & A. Romero C. 25475 (US); Atlántico: Dugand & Jaramillo 1064 (COL) (alt. 200-250 m). Venezuela: Zulia: Lasser 2529 (VEN), Aristiguieta & Montoya 2057 (VEN) (Machiques).

Distribution: The most frequently collected species of the genus in the Americas and one of two (the other being *E. glauca*) which occur both in the West Indies and also in Central and South America.

In the West Indies it has been collected in Cuba (Pinar del Río, Isla de Pinos, Habana, Matanzas, Las Villas, Camaguey and Oriente), Haiti, Dominican Republic and Puerto Rico.

On the continent it has been collected in Mexico (Veracruz, Chiapas), Guatemala (Huehuetenango, Alta Verapaz, Quezaltenango, Zacapa, Retalhuleu, Suchitepequez, Solola, Sacatepequez, Chiquimula, Escuintla, Guatemala, Santa Rosa and Jutiapa), El Salvador (Ahuachapán, Santa Ana, Sonsonate, La Libertad, San Salvador and Morazan), Honduras (Cortés, Morazan, El Paraíso, Glancho and Comayagua), Nicaragua (Segovia, Jinotega, Matagalpa, Leon, Managua and Granada), Costa Rica (Guanacaste, Puntarenas, Alajuela, Heredia, San José and Cartago), Panama (Chiriquí, Veraguas, Los Santos, Cocle, Canal Zone, Darien and Panama), Colombia (Choco, Magdalena, Guajira, Atlántico and Bolívar) and Venezuela (Zulia).

Specimens from trees in cultivation were seen from Mexico, Colombia (Antioquia) and Africa (Tanganyika).

32a. *Erythrina guatemalensis* Krukoff, Amer. Jour. Bot. 28:688. 1941.

Chromosome numbers: $2n = 4x2$, voucher: "Rosengarten s.n. (Krukoff Herb. 9799)" (my files show that Krukoff Herb. 9799 (Crawford s.n.) is of *E. egg-ersii*; the identification cited by Atchison (6:403) therefore needs verification).

Guatemala: Alta Verapaz: Standley 90463 (F), Williams et al. 40396 (F); El Progreso: Steyermark 43613 (F); Zacapa: Steyermark 42364 (F). Honduras: Morazan: L. O. Williams & Molina 13723 (F), L. O. Williams 17451 (EAP).

All specimens cited above were collected at the elevation of ± 1400-± 2700 meters.

Distribution: Confined to the highlands of Guatemala (Alta Verapaz, Baja Verapaz, El Progreso and Zacapa) and Honduras (Morazan).
In Guatemala often planted in hedges.

33. Erythrina americana Miller, Gard. Dict. ed. 8, #5. 1768.

Chromosome numbers: $2n = 42$, voucher: Krukoff 1a from Mexico, Morelos (6:408).

Mexico: Bourgeau 2305 (FI) ("Vallee de Cordoba"), Troll 361 (MUN); Tamaulipas: F. Martinez M. & G. Borja L. 2079 (MEXU) (alt. 800 m) (fr. Sept.), 2752 (fr. Sept.); Veracruz: Wawra 737 (W) (Tuxpan), Maria Souza 2851 (MEXU) (fr. Sept.), Clausen s.n. (Aug. 8, 1955), von Hagen s.n. (F), C. L. Smith 1420; Hidalgo: Moore 1914 (GH); Mexico: Dodds & Simpson 28 (MICH); Morelos: Miranda 233 (MEXU) (fr. May), 1196 (MEXU) (fr. March), 4109 (MEXU) (fr. May), 9288 (MEXU) (fr. Sept.); Puebla: C. E. Smith 4091 (US) (alt. 1000-1800 m) (fr. July), L. Gonzalez Quintero 754 (ENCB) (fl. Apr.), Bruff 1175 (MEXU) (fr. Dec.). Africa: Kenya: Nairobi Arboretum (#120), cult. G. R. Williams 451 (M); Natal: Port Shepstone, cult., W. Wlarais 1135 (M).

Local names: Cosquelite (Tamaulipas); Pemuche, Colorin (Veracruz).

Distribution: Central-eastern and central Mexico (Tamaulipas, San Luis Potosi, Hidalgo, Veracruz, Colima, Mexico, Federal District, Morelos, Puebla, Guerrero and Oaxaca). Specimens from plants in cultivation were seen from U.S. (Alabama and Texas), Europe, Cuba, Hawaii and Africa (Kenya and Natal).
34. Erythrina standleyana Krukoff, Brittonia 3:301. 1939.

Chromosome numbers: $2n = 42$, voucher Atchison 265 (8/30-47) (US), from a plant cultivated at the Atkins Garden & Research Laboratory, Soledad, Cienfuegos, Cuba (6a:544).

Mexico: Yucatan: Lundell & Lundell 7453 (MICH), 8045 (MICH), Klawe M-2B (US).

Distribution: Western Cuba (Pinar del Rio and Isla de Pinos), south-eastern Mexico (Campeche and Yucatan), Belize and northeastern Guatemala (Petén). Confined to the lowlands.

Specimens from plants in cultivation were seen from Cuba. In Mexico it is planted in hedges. This species is represented from Guatemala by a single collection and additional ones would be of interest.

35. Erythrina chiapasana Krukoff, Brittonia 3:304. 1939.

Mexico: Veracruz: Gomez-Pompa 1159 (MEXU) (Sierra de Chiconquiaco, alt. 1280 m); Chiapas: munic. Tuxtla, Breedlove 2612 (US) (fl. Apr.); munic. Comitán, Breedlove & Raven 14447 (US) (fr. Nov.); munic. Venustiano Carranza, Breedlove 10088 (US) (fr. May), Breedlove & Raven 20101 (US) (fl. June); munic. Ixtapa, Breedlove 13788 (US) (fl. Oct.); munic. Bochil, Breedlove 8850 (US) (fl. Febr.); munic. La Trinitaria, Breedlove & Raven 13198 (US) (fr. Oct.); munic. Tenejapa, Breedlove 6098 (US) (fr. July); munic. Huixtán, Breedlove 7338 (US) (fl. Nov.); La Chacóna, Enrique Lopez 7380 (MEXU) (fr. Aug.); N.N.O. del Mactumacza, Miranda 5934 (MEXU) (fl. Jan.); cerros N. O. de Comitán, Miranda 5066 (MEXU) (fl. Dec.). Guatemala: Huehuetenango: near Huehuetenango (alt. 1880 m), Standley 65712 (F) (fl. Febr.).

Distribution: Mexico (Veracruz and Chiapas) and Guatemala (Huehuetenango). Breedlove's specimens were collected at elevations of 1170-(1900)-2333 meters. Standley 65712 was previously identified as E. berteroi.

36. Erythrina goldmani Standley, Contr. U.S. Nat. Herb. 20:181. 1919.

Chromosome numbers: $2n = 42$, voucher Atchison 257 (8/27-47) (US) from a plant cultivated at the Atkins Garden & Research Laboratory, Soledad, Cienfuegos, Cuba (6a:544).

Mexico: Chiapas: N. Chicomuselo, Miranda 7079 (MEXU) (fl. March); munic.

Tuxtla, Breedlove & Raven 13511 (US) (alt. \pm 733 m) (fl. Oct.); munic. La Trinitaria, Breedlove & Raven 8447 (US) (alt. \pm 1,000 m) (fl. Jan.).

Distribution: Known only from the State of Chiapas, Mexico.

37. Erythrina rubrinervia H. B. K., Nov. Gen. & Sp. 6:134. 1824.

Chromosome numbers: $2n = 42$, voucher not seen: Lindsay s.n. (BEF S-8814-11) from Panama, Canal Zone, (this identification should be verified as this species is not found in Panama); $2n = 42$, voucher: Jaramillo s.n. (Krukoff Herb. 9181) from Colombia (6:409).

Venezuela: Merida (alt. 2000-2600 m), Aristiguieta 3337 (US), Breteler 3145 (RB), Bernardi 6859; Tachira: Steyermark & Dunsterville 100536; Lara: Tamayo 3335 (VEN). Colombia: Magdalena: Foster & Earle Smith 1123 (COL) (alt. 2370 m); Antioquia: Duque 1482 (US) (alt. 1500 m), Sandeman 5597 (COL); Santander: Cuatrecasas & Garcia-Barriga 2872 (US) (alt. 2300 m); Boyaca: Rangel Galindo 135 (COL); Caldas: Arbelaez & Cuatrecasas 6463 (US) (alt. 1800-1900 m); Cundinamarca: Cuatrecasas 13558 (US) (alt. 2230-2300 m), 13597 (US) (alt. 1600-1700 m), Martin Grant 9541 (US), Garcia-Barriga 11055 (US) (alt. 1550-1580 m), 11735 (COL) (1040-1320 m), 11970 (US) (alt. 1700 m), 12327 (COL) (alt. 1040-1320 m), 12352 (COL) (alt. 1040-1700 m), 17451 (COL) (alt. 2050-3100 m), Duque-Jaramillo 3217 (COL) (alt. 1750-2080 m), 3258 (COL) (alt. 1750-2080 m), van der Hammen 123 (COL), Arbelaez s.n. (1932) (COL), Fernandez & Mora 1331 (COL) (alt. 1300 m), Fernandez & Perez-Arbelaez 454 (COL) (alt. 1000-1300 m), Idrobo & Hernandez 1546 (COL) (alt. 1900-2100 m); Valle: Duque 922 (US) (alt. 1500 m); Cauca: Karsten s.n. (US), Jaramillo 992 (F) (alt. 1500 m); Tolima: Garcia-Barriga 12248 (US) (alt. 1580-1620 m), T. A. Sprague 274 (US); Huila: E. L. Little, Jr. 7294 (US), 8469 (US). Ecuador: Jose Marrero & E. L. Little, Jr. 6139 (US). Peru: San Martin: Ll. Williams 7782 (F); Cuzco: Vargas 11051 (US); Puno: Metcalf 30636 (A) (alt. 1000-1300 m). Bolivia: Santa Cruz: Cardenas 4055 (F) (Plaza Incha, upper Rio Ichillo-Villagrande, alt. 1300 m), 4575 (US) (Cocotal-Chapare, alt. 1800 m).

Local names: Chocho or Rojizo or Peonia (Colombia), Surigay (Boyaca, Colombia).

Distribution: This species has a very extensive range at the higher elevations (mostly 1500-2000 m) in South America: Venezuela (Merida, Tachira and Lara); Colombia (Magdalena, Norte de Santander, Antioquia, Santander, Caldas, Valle, Cundinamarca, Boyaca, Cauca, Tolima and Huila); Ecuador (Imbabura); Peru (San Martin, Cuzco and Puno) and Bolivia (La Paz and Santa Cruz).

A specimen from a tree in cultivation was seen from Peredeniya, Ceylon.

38. Erythrina mexicana Krukoff, Brittonia 3:309. 1939.

Chromosome numbers: $2n = 42$, voucher: Gieseman s.n. (Krukoff Herb. 15129) from Guatemala (6:409).

Mexico: Guerrero: Hinton 14708; Veracruz: Mario Souza 2850 (MEXU), Ross 209 (US); Oaxaca: Schultes & Reko 687 (Tuxtepec), 952 (Choapam), Carlson 2737 (F), Matuda 32247 (US); Chiapas: Matuda 17601, 7247 (MEXU). Guatemala: Quezaltenango: Steyermark 52127 (alt. 850 m); Suchitepequez: Krukoff 67-2 (near Chicacao, Finca Naranjo), Steyermark 46733 (Volcan Santa Clara, 1250-2560 m); Solola: above finca Moca (alt. 1250-1400 m); Steyermark 48032.

Local names: Colorin or Sompantle (Oaxaca), Ma-nya (by the Chinantecs in Oaxaca), Betutsa-gitse (by the Zapotecs in Oaxaca), Simpante (Chiapas), Ermitche (San Marcos, Guatemala).

Distribution: Mexico (San Luis Potosi, Mexico, Guerrero, Veracruz, Oaxaca and Chiapas), Guatemala (Alta Verapaz, San Marcos, Quezaltenango, Suchi-

tepequez and Solola) and Nicaragua (Granada).

According to Schultes this species is the commonest species of the genus in the districts of Tuxtpec and Choapam in Oaxaca.

39. *Erythrina lanceolata* Standley, Contr. U.S. Nat. Herb. 17:432. 1914.
Chromosome numbers: $2n = 42$, voucher: Lancaster s.n. (Krukoff Herb. 15377) from Costa Rica (6:409).

Country undesign.: Commerson s.n. (F). U.S.: California: Los Angeles (cult.), Westcott 210 (F). Honduras: Santa Barbara: L.O. Williams & Molina 14511 (EAP); Morazan: Molina 2956 (F); El Paraiso: Juvenal Valerio 186D (EAP) (alt. 1400 m). Nicaragua: Matagalpa: Cordill. Central de Nicaragua (alt. 1300 m), L.O. Williams 23670 (F) (fl. Jan.). Costa Rica: Pittier 6893 (BR), G.C. Worthen s.n. (M); Guanacaste: L.O. Williams et al. 26627 (F) (fl. Jan.) (alt. 800 m); Alajuela: Brenes 826 (W) 21824; San Jose: J.A. Echeverria 365 (CR) (Tablazo), Mus. Nac. Costa Rica 34220 (CR) (San Cristobal de Candelaria); Cartago: Jorge Leon 4576 (EAP) (alt. 1330 m).

Distribution: This species has a rather extensive range at higher elevations (mostly 1000-1800 m) in Central America. In Honduras it is known from Santa Barbara, Cortes, Comayagua, Yoro, Morazan, and El Paraiso; in Nicaragua from Matagalpa; in Costa Rica from Guanacaste, Puntarenas, Alajuela, San Jose and Cartago.

40. *Erythrina hondurensis* Standley, Field Mus. Publ. Bot. 4:309. 1929.

Guatemala: Izabal: Steyermark 39080 (F) (Montana del Mico, alt. 35-150 m), 41776 (F) (along Rio Tamaya, alt. 50 m), Raven & Gregory 606 (US). Honduras: Atlantida: Molina 10337 (EAP) (alt. 100 m); Cortes: L.C. Williams 17831 (EAP) (alt. 550 m). Nicaragua: Zelaya: Long 160 (F).

Distribution: Guatemala (Izabal), Honduras (Atlantida and Cortes) and Nicaragua (Zelaya). This is a lowland species.

41. *Erythrina gibbosa* Cufodontis, Arch. Bot. Sist. Fitog. & Genet. 10:34. 1934.

Honduras: Olancho: vicin. Catacamas (450-500 m), Standley 18386 (F). Costa Rica: Alajuela: Mus. Nac. Costa Rica 17699 (CR) (San Ramon, alt. 1400-1600 m), Quiroz 286 (CR) (La Palma de San Ramon), Austin Smith 2771 (F) (Alfaro Ruiz, alt. 1700 m), Brenes 828 (W), 4544 (F), 2767 (near San Ramon); Cartago: Reark 640 (EAP) (alt. 1400 m), Jorge Leon 4576 (TURLA), (Las Concavas, alt. 1330 m); Limon: Shark & Molina 4280 (EAP) (alt. 0 m). Panama: Bocas del Toro: H. von Wedel 1196 (US) (fl. Oct.); Cocle: Dwyer 1839A (US), Allen 2714 (M) (El Valle de Anton, alt. 1000 m), 3622 (GH), Duke 13232 (alt. 700 m).

Local names: Gualiqueme (Honduras), Poro de la montana (Costa Rica).

Distribution: At moderately high elevations in Honduras (Olancho), Costa Rica (Alajuela, Limon, San Jose and Cartago) and Panama (Bocas del Toro, Chiriqui and Cocle).

The collector notes on the label (Allen 2714): "the common *Erythrina* of the entire El Valle de Anton region."

43. *Erythrina costaricensis* M. Micheli, Bull. Herb. Boiss. 2:445. 1894.

Erythrina panamensis Standley, Jour. Wash. Acad. 17:10. 1927.

Erythrina colombiana Krukoff, Brittonia 3:325. 1939.

Costa Rica: Guanacaste: Herb. Pittier 6781 (CR) (Punta Mala, litoral de Pacifico), Oton Jimenez 1244 (CR) (Golfo de Nicoya); San Jose: Stork 3112 (MICH), Jorge Leon 1014 (CR) (Valle del General, alt. 600-700 m), Kohkemper 692 (EAP); Puntarenas: Molina et al. 18175 (F) (fr. March) (vicin. San Isidro El General), L.O. Williams et al. 28762 (F) (along Rio Sonador, alt. 600 m), Manuel Valerio 473 (CR) (Golfo Dulce), Allen 5722 (F) (Palmar Norte de Osa);

Cartago: Cordoba 367 (M), Krukoff 67-1, 67-5 (near Turrialba in woods);
 Limon: T. Samsco Rts.: Paul Shook 2 (EAP) (alt. 300 m). Panama: Bocas del
 Toro: Kirkbride & Duke 158 (M), Lewis et al. 875 (M); Canal Zone: Tyson 1117
 (M), Blue & Tyson 2001 (M), Steyermark & Allen s.n. (EAP) (alt. 70-80 m),
 Killip 39575 (US) (alt. 200-300 m), 10036 (US), Frost s.n. (March 20, 1928)
 (F), Duke 4392 (M), Harvey 501 (F), (fl. low), Brower & Haines 481 (M),
 Oppenheimer 1115 (M), Croat 6286 (M), 6176 (M), 1190 (M), 6225 (M),
 Panama: Duke 9398, 1502; Darien: Shook et al. 895 (M), Kirkbride & Duke 1130
 (M). Colombia: Valle: Guatrecasas 15295 (US); Antioquia: Uribe-Maine 1162
 (alt. 500 m) (COL), Pedraza 1913 (alt. 160 m) (US), Lopez & Sanchez 52 (alt.
 150 m) (US); Boyaca: El Monte, R.L. Lawrence 61° (type coll. of *E. colombiana*).
 Distribution: Costa Rica (Guanacaste, Puntarenas, San Jose, Cartago and
 Limon), Panama (Chiriqui, Bocas del Toro, Canal Zone, Panama and Darien) and
 Colombia (Choco, Antioquia, Valle and Boyaca).

Abundant new collections cited in this paper show that *E. panamensis* cannot be maintained as a distinct species. On an examination of a sheet of the type collection of *E. colombiana* deposited with Arnold Arboretum, which consists of flowers as well as leaves, it became evident that it also cannot be maintained as a distinct species. In 1939 when *E. colombiana* was described, only two sheets deposited at U.S. National Herbarium and the New York Botanical Garden were available and they consist of flowers only.

E. costaricensis is rather uniform in its characters as it occurs in Panama and in the valley of Rio General (provinces San Jose and Puntarenas) Costa Rica. It shows considerable variations in its characters in other parts of Costa Rica. In some of these regions also occurs the related *E. berteroi*, perhaps the most variable *Erythrina* in America. The two may be easily separated if the characteristic pubescence of mature or almost mature leaflet blades beneath (pubescent, often lanate, with long villous whitish deciduous hairs) of *E. costaricensis* is not lost. Otherwise their separation becomes difficult and it is often necessary to use a combination of several characters. The following characters should be observed. Terminal leaflet-blades of *E. costaricensis* are usually longer than broad and are acuminate at the apex (they are often broader than long and usually acute at the apex in *E. berteroi*). Calyxes of *E. costaricensis* are usually about as long on the carinal as on the vexillar side and irregularly lobed at margin (they are usually much longer on the carinal than on the vexillar side in *E. berteroi*), and the flower-buds are broader and round at the apex. Pods of *E. costaricensis* are moniliform and usually densely pubescent, remnants of pubescence remaining in part toward maturity, and the seeds are uniformly scarlet (those of *E. berteroi* usually have a black line extending from the hilum for approximately 1 mm toward the chalazal end).

44. *Erythrina folkersii* Krukoff & Moldenke, *Phytologia* 1:286. 1938.
 Chromosome numbers: $2n = 42$, voucher: Cons. Forests s.n. (tree #10)
 from Belize (this voucher was identified by me) (6:109).

Mexico: Veracruz: Gomez & Riba 236 (MEXU), L. Gonzalez 4. 2011 (ENCB) (fl. March, no leaves), Vera Santos 2777 (MICH) (Toluca); Oaxaca: Martinez-Calderon 51 (A). Guatemala: Alta Verapaz: vicinity of Cubilguitz, Steyermark 11661 (alt. 350-450 m).

Distribution: Southern Mexico (basin of Coatzacoalcas River in the states of Oaxaca and Veracruz and the State of Chiapas), throughout and in eastern Guatemala (departments of Alta Verapaz and Itzabal). This is a low-land species.

According to L.L. Williams, often grown in Mexico for fence posts and as a shade for cacao and coffee.

45. Erythrina macrophylla De Candolle, Prodr. 2:411. 1825.

Chromosome numbers: $2n = 42$, voucher: Armstrong 48 from Guatemala, Quezaltenango (this voucher was identified by me) (6:409).

Guatemala: Huehuetenango: Steyermark 48971 (F) (alt. 1500-1600 m), 49768 (F) (alt. 2500 m), 51871 (F) (alt. 1500-2500 m), Breedlove 11670 (US) (alt. \pm 3000 m); Quiché: west of Chichicastenango, Molina et al. 16137; Quetzaltenango: Standley 83921 (F) (alt. 2150-2300 m), 84802 (F) (alt. 2250-2400 m); Chimaltenango: Molina et al. 16137 (Tecpan, alt. 2550 m), Barbara Scors 1 (F), Standley 80139 (F), 80118 (F) (alt. 2250-2400 m), 83173 (F) (alt. 2250 m); Guatemala: Standley 80515 (F) (alt. 1800-2300 m). El Salvador: San Salvador: Carlson 420 (F) (alt. 1680-1890 m), Allen 7193 (F) (alt. 1500-2000 m). Honduras: Intibuca: Standley 25321 (EAF).

Local names: Míche (Huehuetenango, Guatemala); Pito de montana or Ajuijote (El Salvador).

Distribution: At higher elevations in Guatemala (Huehuetenango, Quezaltenango, Solola, Quiché, Chimaltenango, Guatemala and Sacatepequez), El Salvador (San Salvador) and Honduras (Intibuca).

A specimen from a tree in cultivation was seen from Sao Paulo, Brazil.

46. Erythrina cochleata Standley, Contr. U.S. Nat. Herb. 20:179. 1919.

Costa Rica: Alajuela: San Carlos, Quebrada de Palo, alt. 625 m, Austin Smith 1910 (M), Cartago: Anastasio Alfaro 5 (F), 6 (CR), 7 (F), (La Fuente Peralta, alt. 1300 m), Jorge Leon 1524 (TURIA) (Turrialba, La Isabel) (alt. 650 m).

Anastasio Alfaro's specimens were collected near the divide between the Pacific and Atlantic watersheds.

Distribution: Known only from eastern Costa Rica (Alajuela, Cartago and Limón) and central Colombia (Caldas). Further collections are needed to establish its range.

47. Erythrina chiriquensis Krukoff, Brittonia 3:322. 1938.

Costa Rica: Cartago: Finca Las Quinas, San Antonio, Turrialba, Krukoff 7a. Panama: Chiriqui: Tyson 872 (M) (alt. 2100 m), Stern & Chambers 81 (M), Allen 3471 (vicin. of Cerro Punta, alt. 2000 m), 4757 (OH), Butcher s.n. (March 10, 1968) (alt. 6000 ft.).

Distribution: At higher elevations in Costa Rica (Cartago) and Panama (Chiriqui).

48. Erythrina smithiana Krukoff, Brittonia 3:323. 1939.

Ecuador: Guayas (alt. 40 m): Camp E-3623, Carlos Jativa & Carl Epling 925 (US) (fl. Aug.), Fagerlind & Wilson s.n. (23/9-1952) (S), 243 (S); Los Rios: E.L. Little, Jr. 6189 (US), Acosta Solis 10833 (F), Carlos Jativa & Carl Epling 932 (US) (fl. July) (alt. 70 m), Harling 260 (S) (alt. 30 m), 431 (S) (alt. 30 m) (fl. red), Sparre 17980 (S) (alt. 20 m) (fl. flame red); Bolívar: Acosta Solis 6025 (F) (1270 m); Chimborazo: Acosta Solis 5225 (as to fl.) (F), Harling 6047 (S) (fl. red), Asplund 15506 (S) (alt. 1100 m); El Oro: E.L. Little, Jr. 6717 (US), 6727 (US), A.J. Gilmartin 758 (US); Loja: Steyermark 51359 (F) (alt. 1520 m). Peru: Pávon s.n. (G), 749 (G).

Local names: Porotillo (Los Rios, Loja).

Distribution: Ecuador (Guayas, Los Rios, Bolívar, Chimborazo, El Oro and Loja). Specimens from Colombia (El Valle) and Peru were placed here with doubts.

Apparently cultivated for live hedges in Bolívar, Ecuador (Acosta Solis 6025). Flowers are described as "rojas" (Acosta Solis 6025), "deep scarlet-red" (Steyermark 51359), "crimson" (Camp E-3623), and "flame red" (Sparre 17980).

X. Variegatae

50. Erythrina velutina Willdenow, Ges. Nat. Freunde Berlin Neue Schr. 3: 126. 1801.

Chromosome numbers: $2n = 42$, voucher: Sobrinho s.n. (Krukoff Herb. 9263); $2n = 42$, voucher not seen: Servico Forestal s.n. (USDA plant introduction number 150394) from Brazil (6:409).

St. Thomas: Ledru s.n. (FI). Dominican Republic: Bro. Basilio A. Lavastre 2075. Haiti: Ekman, H 8221. Antigua: Box 1410 (US). Grenada: Howard 10910. Curacao: Bro. M. Arnaldo 1613 (US). Colombia: Magdalena: Castaneda s.n. (Febr. 1948), T. Hanbury-Tracy 287 (US), Pater C. Vogl 523 (US), Romero-Castaneda 792 (COL); Guajira: Dagand 6629 (COL), Saravia & Johnson 95 (COL), 402 (COL), Romero-Castaneda 4503 (COL). Ecuador: Foot of Cerro Monte Cristo, M.W. corner: A.J. Gilmartin 772 (US); Manabi: Acosta Solis 10669 (F), Carlos Jativa & Carl Epling 496 (US), Oscar Haught 3505 (US). Peru: Allenberg 1103 (J) (Cienega S. von Zorritos); Lambayeque: Hutchison 1368. Venezuela: Brother Elias s.n., Steiermark 62347 (M); Carabobo: Saer d'Heugert 829, 810; Aragua: Burkart 10176 (VEN) (fl. March), 16180 (VEN) (fl. March); Federal District: Killip 27730 (US), Aristiguieta 1997 (VEN) (fl. Sept.); Guarico: Aristiguieta 6040 (VEN) (fl. March), 6071 (VEN) (fl. March), Tamayo 3379 (VEN) (fl. March); Sucre: Steiermark 62347 (F); Anzoategui: Foster D. Smith 42 (US), E.L. Little, Jr. 16057 (VEN) (fl. Dec.). Brazil: J.B.R.J. 57602 (RB); Piaui: Thoresina, Locke s.n. (July 4, 1907) (FG), J.B.R.J. 11958 (RB); Ceara: Huber s.n. (FG), Cutler 8239 (US); Paraiba: Acude do Fariao, J.B.R.J. 93592 (RB); Pernambuco: Recife, Vasc. Sobrinho 899 (IAN), Lima 50-669 (PERN), Pickel 1219 (PERN); Bahia: Veloso 1 (US), Pereira 2156, J.B.R.J. 95980 (RB), 129817 (RB) (Palmeira para Santo Soares), 132250 (RB) (Milagres); Minas Geraes: Mendes Magalhaes 6105 (RB) (Lagoa Grande, Caatinga), s.n. (10/10-1950) (UB); Rio Janeiro and Guanabara: Constantino s.n. (Sept. 1924), da Silva s.n. (Sept. 20, 1945), Luiz Emygdio 2133 (R), J.B.R.J. 19117 (RB) (Lagoa, cult.), 16563 (RB) (Jard. Bot. cult.), 11438 (RB) (Jard. Bot. cult.), 74390 (RB) (Jard. Bot. cult.), Fabst 5693 (HB) (near Itanhangra Golf Club); Sao Paulo: Inst. Bot. Sao Paulo 37001 (SP) (Jard. Bot. Sao Paulo, cult.), 53066 (SP) (Jard. Bot. Sao Paulo, cult.); Fernando de Noronha: Lima 55-2182 (PERN), 55-2254 (PERN).

Local names: Pionia (Guajira, Colombia).

Distribution: Apparently confined to the drier tropics in the West Indies, northern Venezuela and northern Colombia, reappearing on the Pacific coast of South America in Ecuador (incl. the Galapagos Islands) and Peru, and on the Atlantic coast in Brazil from Piaui to Sao Paulo.

In the West Indies it has been collected in Cuba (Habana), Jamaica, Gran Cayman, Haiti, Dominican Republic, St. Thomas, Antigua, Grenada, Tobago, Trinidad, Curacao and Aruba.

In South America it has been collected in Colombia (Coajira, Magdalena), Venezuela (Falcon, Carabobo, Aragua, Federal District, Guarico, Miranda, Sucre and Anzoategui), Ecuador (Manabi, Guayas and the Galapagos Islands), Peru (Lambayeque) and Brazil (Piaui, Ceara, Paraiba, Pernambuco, Bahia, Minas Geraes, Rio de Janeiro, Guanabara and Sao Paulo).

Specimens from trees in cultivation were seen from Bermuda, Bahamas, Martinique, Guatemala, Surinam, Brazil (Amazonas) and Paraguay.

Of the American species only E. glauca has a more extensive range than E. velutina. These two species and E. berteroeana are the only ones which occur both in the West Indies and in South America.

The collector notes on the label (Box 1410 from Antigua): "There are probably less than half a dozen of these trees in the Island growing apparently wild in the higher parts of the central region." This specimen approaches E. grisebachii, as does Luiz Emydio 2133 from Rio de Janeiro. 50a. Erythrina velutina fma. aurantiaca (Ridley) Krukoff, Brittonia 3:329. 1939.

Brazil: Fernando de Noronha: Lima 55-2255 (PERN).

Distribution: Fernando de Noronha and State of Ceara, Brazil.

Altogether I have studied more than 133 collections of E. velutina and 27 collections of E. grisebachii, many of which have seeds. All seeds examined are uniformly red. E. velutina fma. aurantiaca (with seeds blackish except for a red band around hilum) apparently is rare as it has been collected only on three occasions on the island of Fernando Noronha, and on four occasions in Ceara, Brazil. This statement is backed by the observations of Lima who collected typical E. velutina as well as E. velutina fma. aurantiaca on the island of Fernando Noronha in November, 1955. According to Lima, E. velutina fma. aurantiaca is rare on the island, whereas typical E. velutina is frequent.

51. Erythrina grisebachii Urban, Symb. Ant. 9:453. 1928.

Chromosome numbers: $2n = 42$, voucher not seen: Walsingham s.n. from Cuba, Atkins Gard & Research Lab. I accept the identification by Walsingham without reservations as he knew this species and sent me seeds and specimens of it on several occasions (Krukoff Herb. 9134, 9316, 9430 and 9898) (6:408).

Cuba: Roble 1840; Habana: Bro. Leon 14786 (GH).

Distribution: Endemic to Cuba (Pinar del Rio, Habana, Matanzas, Las Villas and Oriente).

In 1939 I stated: "I retain Urban's species for the time being, but field studies may prove that it is better regarded as a variety or an ecological form of E. velutina" (1:331). Since then no progress has been made on the problem, and a trip to Cuba to examine these two entities in the field presently is out of question.

Doubtful species and species excluded from the genus

Twenty-five species either doubtful or excluded from the genus were discussed in the monograph (1:331-336). Subsequently my disposal of three of these, all based originally on cultivated plants of unknown geographic origin, have been confirmed:

3. Erythrina constantiana Micheli, Rev. Hort. 68:524. 1896.

In 1939 I stated that this was obviously an African plant, probably conspecific with E. caffra Thunb. It has since been placed in synonymy under this species by McClintock in 1953 (44:56).

9. Erythrina insignis Todaro, Nuovi Gen. 66. 1861.

In 1939 I stated (1:333): "It is obviously a South African plant".

Collett (40:223) placed it in synonymy under E. caffra Thunb. in 1941.

25. Erythrina viarum Todaro, Nuovi Gen. 62. 1861.

In 1939 I suggested that this was a South African plant (1:336) and in 1941 Collett placed it in synonymy under E. caffra Thunb. (40:223).

Asiatic-Polynesian and African species cultivated in AmericaAsiatic-Polynesian species1. Erythrina variegata L.

This species is widely grown in America, especially in the West Indies. I have seen specimens from the U.S. (Florida and California), Cuba, Jamaica, Hispaniola (Haiti and Dominican Republic), Puerto Rico, Tortola, St. Croix, St. Martin, Guadeloupe, Martinique, Canouan, Belize, Guiana, and Brazil (Rio de Janeiro and Sao Paulo). It was introduced to America before 1825 as shown by the fact that it was described by Alph. De Candolle under the name E. divaricata (2:226).

2. Erythrina subumbrans (Hasskarl) Merrill is grown in Surinam.

I have seen botanical specimens or actual plants of the following species which are in cultivation in California:

3. Erythrina arborescens Roxburgh4. Erythrina fusca Loureiro (= Erythrina ovalifolia Roxb.)5. Erythrina tahitensis Nadeau (= Erythrina indica Lam.)6. Erythrina vespertilio BenthAfrican species

I have seen botanical specimens or actual plants of the following species which are in cultivation in California:

7. Erythrina acanthocarpa E. Meyer8. Erythrina caffra Thunberg (also in Bermuda)9. Erythrina humeana Sprengel

also Erythrina humeana var. raja (Weissn.) Harvey

10. Erythrina latissima E. Meyer11. Erythrina lysistemon Hutchinson12. Erythrina seyeri Harvey

Of these the most commonly cultivated are Erythrina caffra and Erythrina humeana.

13. Erythrina chrysina Lamour ex De Candolle is grown in Cuba (Habana).

14. Erythrina senegalensis De Candolle is grown in Cuba (Habana and Las Villas) and in Brazil (Rio de Janeiro and Guanabara, Sao Paulo and Campinas).

Appendices

In Appendix I are listed species as they are presently recognized by me; also species which were described as new, and/or reduced to synonymy, since my monograph appeared in 1939. This list will be helpful to a future monographer of the genus and in identification of specimens.

In Appendix II species are grouped under the authors of the species.

In Appendix III species are grouped under the collectors of the type specimens.

In Appendix IV species are grouped under the countries of origin of the type specimens.

In Appendix V species are grouped by the countries where they are found. This information will be helpful for regional floras and as a short-cut in identifications.

In Appendix VI are given statistical data on distribution of the species in various countries.

In Appendix VII are listed species of which leaves and/or flowers and/or fruits are still unknown. This will be helpful to collectors and a future monographer of the genus.

In Appendix VIII are listed references to illustrations which are very helpful in identification of specimens. In the genus Erythrina they are much better than descriptions.

In Appendix IX are listed chromosome numbers published for American species of Erythrina. More detailed information on this is given under respective species. An effort was made to trace, as far as possible, the real identity and the origin of plants from which chromosome numbers were determined. This applies to Erythrina species listed in Appendix IX as well as in Appendix X.

In Appendix X are listed chromosome numbers published for Asiatic-Polynesian and Australian species of Erythrina.

In Appendix XI are listed chromosome numbers published for African species of Erythrina.

In Appendix XII are given statistical data on the specimens which were examined and cited in the monograph and its

supplements. These data give information at a glance as to which species are poorly collected and require further collecting.

In Appendix XIII are given changes in the identifications of specimens.

In Appendix XIV are given citations of places of deposit of specimens in this and other serial papers on Erythrina.

Appendix I

List of Known American Species of Erythrina

- I. Fuscae
 - 1. glauca
- II. Cristae-galli
 - 2. crista-galli
 - 3. falcata
- III. Vernae
 - 4. poeppigiana
 - 5. ulei
 - 6. dominguezii
 - 7. verna
 - 8. flammea
- IV. Speciosae
 - 9. speciosa
- V. Edules
 - 10. polychaeta
 - 11. schimpffii
 - 12. edulis
- VI. Leptorhizae
 - 13. breviflora
 - 13a. " fma. petraea
 - 13b. " fma. oaxacana
 - 14. leptorhiza
 - 15. horrida

- 16. *montana*
- VII. *Corallodendra*
 - 17. *peruviana*
 - 18. *pallida*
 - 19. *mitis*
 - 20. *buchii*
 - 21. *leptopoda*
 - 21a. *elenae* (reviewed in 3rd. suppl.)
 - 22. *eggersii*
 - 23. *amazonica*
 - 24. *similis*
 - 25. *corallodendrum* var. *coralloderdrum*
 - 25a. " var. *bicolor*
 - 25b. " var. *connata*
- VIII. *Cubenses*
 - 26. *cubensis*
 - 26a. *oliviae* (described in 3rd suppl.)
- IX. *Herbaceae*
 - 27. *herbacea*
 - 28. *coralloides*
 - 29. *flabelliformis*
 - 30. *lanata*
 - 32. *berteroana*
 - 32a. *guatemalensis* (described in 1st. suppl.; 2:688)
 - 33. *americana*
 - 34. *standleyana*
 - 35. *chiapasana*
 - 36. *goldmanii*
 - 37. *rubrinervia*
 - 38. *mexicana*
 - 39. *lanceolata*
 - 40. *hondurensis*
 - 41. *gibbosa*
 - 43. *costaricensis*
 - 44. *folkersii*

- 45. macrophylla
- 46. cochleata
- 47. chiriquensis
- 48. smithiana

- X. Variegatae
- 50. velutina
- 50a. velutina fma. aurantiaca
- 51. grisebachii

Species reduced to synonymy since the monograph (1939).

E. occidentalis Standley was reduced to synonymy under E. lanata Rose whereas E. panamensis Standley and E. colombiana Krukoff - under E. costaricensis M. Micheli, all in 3rd supplement.

Appendix II

Authors of the species

- | | |
|---|--|
| Andrews, H. | - speciosa (1). |
| Bentham, G. | - falcata (1). |
| Britton, N.L. & J.N. Rose | - pallida (1). |
| Cook, O.F. (orig. described
by W.G. Walpers) | - poeppigiana (1). |
| Cufodontis, G. | - gibbosa (1). |
| De Candolle, Alph. | - breviflora, leptorhiza, horrida
coralloides, macrophylla (5). |
| Diels, L. | - schimpffii (1). |
| Harms, H. | - ulei, polychaeta (2). |
| Hassler, E. | - dominguezii (1). |
| Herzog, Th. | - flammea (1). |
| Howard, R.A. & W. Briggs | - elenae (1). |
| Humboldt, F.H.A., A.J.A. | - rubrinervia (1). |
| Bonpland & C.S. Kunth | |
| Jacquin, N.J. von | - mitis |
| Kearney, T.H. | - flabelliformis (1). |

- Krukoff, B.A. - breviflora fma. petraea,
breviflora fma. oaxacana,
peruviana, amazonica, similis,
corallodendrum var. bicolor,
corallodendrum var. connata,
oliviae, guatemalensis,
standleyana, chiapasana, mexicana,
chiriquensis, smithiana, velutina
fma. aurantiaca (orig. described
by H.N. Ridley). (10 + 5)
- Krukoff, B.A. & H.N. - eggersii, folkersii (2).
Moldenke
- Linnaeus, C. - crista-galli, corallodendrum
var. corallodendrum, herbacea (3).
- Miller, P. - americana (1).
- Micheli, M. - costaricensis (1).
- Rose, J.N. - lanata (1).
- Rose, J.N. & P.C. - montana (1).
- Standley
- Standley, P.C. - goldmanii, lanceolata,
hondurensis, cochleata (4).
- Triana, J.J. - edulis (1).
- Urban, I. - buchii, berteriana, grisebachii (3).
- Urban, I. & E.L. Ekman - leptopoda (1).
- Velloso, J.M. - verna (1).
- Willdenow, C.L. - glauca, velutina (2).
- Wright, C. - cubensis (1).

Appendix III

Collectors of the type specimens

- Bartlett, H.H. - folkersii (1).
- Bertero, C.G. - berteriana (1).
- Bredemeyer, F. - glauca, velutina (2).

- | | |
|---|--|
| Brenes, A.M. | - gibbosa (1). |
| Britton, N.L. | - pallida (1). |
| Britton, N.L. & E.G. | - corallodendrum var. connata
(0 + 1). |
| Britton
Britton, N.L., P. Wilson
& A.D. Selby | - standleyana (1). |
| Buch, W. | - buchii (1). |
| Converse, O.L. | - oliviae (1). |
| Ekman, E.L. | - leptopoda, grisebachii (2). |
| Goldman, E.A. | - chiapasana, goldmanii (2). |
| Hassler, E. | - similis (1). |
| Herzog, Th. | - flammea (1). |
| Hinton, G.B. | - mexicana (1). |
| Houstoun, W. | - americana (1). |
| Howard, R.A. et al. | - elenae (1). |
| Humboldt, F.H.A. & A.J.A. | - rubrinervia (1). |
| Bonpland | |
| Jorgensen, P. | - dominguezii (cotype) (1). |
| Krukoff, B.A. | - amazonica (1). |
| Lampert, A.B. | - speciosa (1). |
| Martius, C.F.P. von | - falcata (1) |
| Palmer, E. | - lanata (1)1 |
| Pittier, H. | - costaricensis (1). |
| Poeppig, E.F. | - poeppigiana (1). |
| Purpus, C.A. | - breviflora fma. petraea (0+1). |
| Ridley, H.N., Lea & Ramage | - velutina fma. aurantiaca (0+1). |
| Rimbach, A. | - polychaeta (1). |
| Rojas, T. | - dominguezii (cotype) (1). |
| Rose, J.N. | - montana (1). |
| Rose, J.N. & G. Rose | - smithiana (1). |
| Schimpff, H.J.F. | - schimpffii (1). |
| Sesse, M. & J.M. Mocino | - breviflora, leptorhiza, horrida,
coralloides (4). |
| Shafer, J.A. | - corallodendrum var. bicolor (0+1). |
| Smith, L.C. | - breviflora fma. oaxacana (0+1). |
| Standley, P.C. | - guatemalensis, hondurensis (2). |

Tessman, G.	- peruviana (1).
Tonduz, A.	- cochleata (1).
Triana, J.J.	- edulis (1).
Ule, E.H.G.	- ulei (1).
Werkle, C.	- lanceolata (1).
White, G. & P. White	- chiriquensis (1).
Wilcox, T.E.	- flabelliformis (1).
Wright, C.	- cubensis (1).
collector undesignated	- crista-galli, verna, mitis, eggersii, corallodendrum var. corallodendrum, herbacea, macrophylla (7).

Note : Types probably do not exist and/or were not designated for 14 species: glauca, crista-galli, verna, speciosa, breviflora, leptorhiza, horrida, mitis, eggersii, corallodendrum var. corallodendrum, cubensis, herbacea, coralloides, and velutina.

Appendix IV

Countries of origin of the type specimens

U.S.A.	: herbacea, flabelliformis (2).
Cuba	: elenae, cubensis, standleyana, grisebachii (4).
Jamaica	: corallodendrum var. corallodendrum (1).
Haiti	: buchii, leptopoda (2).
St. Thomas	: corallodendrum var. connata (0+1).
St. Croix	: eggersii (1).
Montserrat	: corallodendrum var. bicolor (0+1).
Trinidad	: pallida (1).
Mexico	: breviflora, breviflora fma. petraea, breviflora fma. oaxacana, leptorhiza, horrida, montana, oliviae, coralloides, lanata, americana, chiapasana, goldmanii, mexicana (12+2).

Belize	: folkersii (1).
Guatemala	: guatemalensis (1).
Honduras	: hondurensis (1).
Costa Rica	: lanceolata, gibbosa, costaricensis, cochleata (4).
Panama	: chiriquensis (1).
Colombia	: edulis, berteriana, rubrinervia (3).
Venezuela	: glauca, mitis, velutina (3).
Ecuador	: polychaeta, schimpffii, smithiana (3).
Peru	: poeppigiana, ulei, peruviana (3).
Brazil	: crista-galli, falcata, verna, amazonica, velutina fma. aurantiaca (4+1).
Bolivia	: flammea (1).
Paraguay & Argentina	: dominguezii (co-types), similis (2).
cultivated	: speciosa (native to Brazil), macrophylla (native to Central America) (2).

Appendix V

List of species which are known to occur in various countries

<u>U.S.A.:</u>	herbacea, flabelliformis (2). (crista-galli, falcata, americana cult.).
<u>Bermuda:</u>	(crista-galli, corallodendrum var. corallodendrum, herbacea cult.).
<u>Bahamas:</u>	(velutina cult.).
<u>Cuba:</u>	glauca, elenae, cubensis, berteriana, standleyana, velutina, grisebachii (7). (crista-galli, poeppigiana, herbacea cult.).
<u>Jamaica:</u>	glauca, corallodendrum var. corallodendrum, velutina (3). (crista-galli, poeppigiana cult.).
<u>Haiti:</u>	buchii, leptopoda, corallodendrum var. corallodendrum, berteriana, velutina (5). (poeppigiana cult.).
<u>Dominican Republic:</u>	glauca, berteriana (2). (poeppigiana cult.).

- Puerto Rico: glauca, eggersii, berteriana (3). (poepigiana cult.).
- St. Thomas: eggersii, corallodendrum var. connata, velutina (2+1).
- Vieques: eggersii (1).
- St. Croix: corallodendrum var. connata (0+1).
- Montserrat: corallodendrum var. bicolor (0+1).
- Antigua: corallodendrum var. connata (?), velutina (1+1).
- Guadeloupe: glauca, corallodendrum var. bicolor (1+1). (crista-galli, poepigiana cult.).
- Martinique: glauca, pallida (?), corallodendrum var. bicolor (2+1). (crista-galli. poepigiana, velutina cult.).
- Sta Lucia: corallodendrum var. corallodendrum (?), corallodendrum var. bicolor (1+1).
- St. Vincent: glauca, pallida, corallodendrum var. bicolor (2+1).
- Grenada: corallodendrum var. bicolor, velutina (1+1).
- Trinidad and Tobago: glauca, pallida, velutina (3). (crista-galli, poepigiana cult.).
- Aruba: velutina (1).
- Curacao: velutina (1). (corallodendrum var. corallodendrum cult.).
- Mexico: breviflora, breviflora fma. petraea, breviflora fma. oaxacana, leptorhiza, horrida, montana, oliviae, herbacea, coralloides, flabelliformis, lanata, berteriana, americana, standleyana, chiapasana, goldmanii, mexicana, folkersii, macrophylla (17+2).
- Central America:
- Belize: standleyana, folkersii (2). (glauca cult.).
- Guatemala: glauca, berteriana, guatemalensis, standleyana, chiapasana, mexicana, hondurensis, folkersii, macrophylla (9). (crista-galli, poepigiana and velutina cult.).

- El Salvador: *glauc*a, *berteroana*, *macrophylla* (3).
(*poeppigiana* cult.).
- Honduras: *glauc*a, *berteroana*, *guatemalensis*, *lanceolata*,
hondurensis, *gibbosa*, *macrophylla* (7).
(*poeppigiana* cult.).
- Nicaragua: *glauc*a, *berteroana*, *mexicana*, *lanceolata*,
hondurensis, *costaricensis* (6). (*poeppigiana*
cult.).
- Costa Rica: *glauc*a, *berteroana*, *lanceolata*, *gibbosa*,
costaricensis, *cochleata*, *chiriquensis*, (7).
(*crista-galli* and *poeppigiana* cult.).
- Panama: *glauc*a, *poeppigiana*, *berteroana*, *gibbosa*,
costaricensis, *chiriquensis* (6).
- South America:
- Venezuela: *glauc*a, *poeppigiana*, *edulis*, *pallida*, *mitis*,
berteroana, *rubrinervia*, *velutina* (8).
- Guiana: *glauc*a, *amazonica* (2). (*crista-galli* cult.).
- Surinam: *glauc*a, *amazonica* (2). (*poeppigiana*, *velutina*
cult.).
- French Guiana: *glauc*a, *amazonica* (2).
- Colombia: *glauc*a, *poeppigiana*, *ulei*, *edulis*, *amazonica*,
berteroana, *rubrinervia*, *cochleata*, *smithiana* (?),
velutina, (10).
- Peru: *glauc*a, *falcata*, *poeppigiana*, *ulei*, *edulis*,
peruviana, *amazonica*, *rubrinervia*, *smithiana* (?),
velutina (10). (*crista-galli*, *speciosa* cult.).
- Ecuador: *glauc*a, *poeppigiana*, *ulei*, *polychaeta*, *schimpffii*,
edulis, *peruviana*, *rubrinervia*, *smithiana*,
velutina (10).
- Brazil: *glauc*a, *crista-galli*, *falcata*, *poeppigiana*, *ulei*,
dominguezii, *verna*, *flammea*, *speciosa*, *amazonica*,
similis, *velutina*, *velutina* fma. *aurantiaca*
(12+1).
- Bolivia: *glauc*a, *crista-galli*, *falcata*, *poeppigiana*,
ulei, *dominguezii*, *flammea*, *similis*, *rubrinervia*
(9).

Paraguay: crista-galli, falcata, dominguezii, similis (4).
(velutina cult.).

Uruguay: crista-galli (1).

Argentina: crista-galli, falcata, dominguezii (3).

On a recent trip I have seen botanical specimens or actual plants of the following species which are in cultivation in California: E. poeppigiana (Walpers) O.F. Cook, E. speciosa Andrews, E. coralloides De Candolle, E. berteriana Urban, E. macrophylla De Candolle.

Appendix VI

Statistical data on species (and varieties and forms) known
to occur in various countries

	<u>Collected</u>	<u>Endemic</u>
U.S.A.	2	-
West Indies	12 + 2	
Cuba	7	3
Jamaica	3	-
Haiti	5	2
Dominican Republic	2	-
Puerto Rico	3	-
Lesser Antilles	4 + 2	0 - 1
Trinidad and Tobago	3	-
Aruba and Curacao	1	-
Mexico	17 + 2	8 + 2
Central America	14	
Belize	2	-
Guatemala	9	-
El Salvador	3	-
Honduras	7	-
Nicaragua	6	-
Costa Rica	7	-
Panama	6	-

	<u>Collected</u>	<u>Endemic</u>
South America	22 + 1	
Venezuela	8	1
Guiana, Surinam and French Guiana	2	-
Colombia	10	-
Peru	10	-
Ecuador	10	2
Brazil	12 + 1	2 + 1
Bolivia	9	-
Paraguay	4	-
Uruguay	1	-
Argentina	3	-

Appendix VII

List of species of which leaves and/or flowers and/or fruits
are still unknown

	lvs.	flrs.	frts.
I. Fuscae			
1. glauca	+	+	+
II. Cristae-galli			
2. crista-galli	+	+	+
3. falcata	+	+	+
III. Vernae			
4. poeppigiana	+	+	+
5. ulei	+	+	+
6. dominguezii	+	+	+
7. verna	+	+	-
8. flammea	+	+	+
IV. Speciosae			
9. speciosa	+	+	+
V. Edules			
10. polychaeta	+	+	-
11. schimpffii	+	+	+

12. edulis			+	+	+
VI. Leptorhizae					
13. breviflora			+	+	+
13a. "	fma. petraea		+	+	+
13b. "	"	oaxacana	+	+	-
14. leptorhiza			+	+	+
15. horrida			+	+	+
16. montana			+	+	-
VII. Corallodendra					
17. peruviana			+	+	+
18. pallida			+	+	+
19. mitis			+	+	+
20. buchii			+	+	+
21. leptopoda			+	+	+
21a. elenae			+	-	+
22. eggersii			+	+	+
23. amazonica			+	+	+
24. similis			+	+	-
25. corallodendrum	var. corallodendrum		+	+	+
25a. "	var. bicolor		+	+	+
25b. "	"	connata	+	+	-
VIII. Cubenses					
26. cubensis			+	+	+
26a. oliviae			+	+	+
IX. Herbaceae					
27. herbacea			+	+	+
28. coralloides			+	+	+
29. flabelliformis			+	+	+
30. lanata			+	+	+
32. berteriana			+	+	+
32a. guatemalensis			+	+	+
33. americana			+	+	+
34. standleyana			+	+	+

35. chiapasana	+	+	+
36. goldmanii	+	+	+
37. rubrinervia	+	+	+
38. mexicana	+	+	+
39. lanceolata	+	+	+
40. hondurensis	+	+	+
41. gibbosa	+	+	+
43. costaricensis	+	+	+
44. folkersii	+	+	+
45. macrophylla	+	+	+
46. cochleata	+	+	+
47. chiriquensis	+	+	+
48. smithiana	+	+	+

X. Variegatae

50. velutina	+	+	+
50a. " fma. aurantiaca	+	+	+
51. grisebachii	+	+	+

Note

As seen from the above table, leaves and/or flowers and/or fruits of comparatively few species remain uncollected and unknown by comparison with other genera of more or less similar size and with a center of the distribution in the tropics.

Of 51 species (plus 2 varieties and 3 forms) known to date, flowers are not yet known of 1 species (E. elenae) and fruits and/or seeds of 4 species (and 1 variety and 1 form) (E. verna, E. polychaeta, E. breviflora forma oaxacana, E. montana, E. similis, and E. corallodendrum var. connata).

Appendix VIIIIllustrations

(To find the illustrations see a given reference, mostly the Monograph and/or Suppl. 1.)

I.	Fuscae	
	1. glauca	1:225; 2:684
II.	Crista-galli	
	2. crista-galli	1:229; 2:684
	3. falcata	---
III.	Vernae	
	4. poeppigiana	1:236
	5. ulei	2:684
	6. dominguezii	---
	7. verna	1:241
	8. flammea	---
IV.	Speciosae	
	9. speciosa	1:244; 2:684
V.	Edules	
	10. polychaeta	---
	11. schimpffii	2:684
	12. edulis	1:249
VI.	Leptorhizae	
	13. breviflora	1:255
	13a. " forma petraea	---
	13b. " " oaxacana	---
	14. leptorhiza	1:257
	15. horrida	1:259; 2:684
	16. montana	1:260
VII.	Corallodendra	
	17. peruviana	---
	18. pallida	---
	19. mitis	1:265; 2:684
	20. buchii	---
	21. leptopoda	---
	21a. elenae	---
	22. eggersii	1:269
	23. amazonica	---
	24. similis	---
	25. corallodendrum var. corallodendrum	1:273
	25a. " var. bicolor	1:276

25b. corallodendrum var. connata	---
VIII. Cubenses	
26. cubensis	2:686
26a. oliviae	---
IX. Herbaceae	
27. herbacea	1:283
28. coralloides	1:286; 3:53,54
29. flabelliformis	2:686
30. lanata	1:289
32. berteriana	---
32a. guatemalensis	---
33. americana	1:299
34. standleyana	2:686
35. chiapasana	---
36. goldmanii	---
37. rubrinervia	---
38. mexicana	2:686
39. lanceolata	---
40. hondurensis	---
41. gibbosa	---
43. costaricensis	1:316
44. folkersii	---
45. macrophylla	2:686
46. cochleata	---
47. chiriquensis	---
48. smithiana	---
X. Variegatae	
50. velutina	1:327; 2:686
50a. velutina fma. aurantiaca	1:329
51. grisebachii	---

Note

As seen from the above table the American species of Erythrina are well illustrated when compared with other genera of plants of more or less similar size and with a center of the distribution in the tropics.

Of 51 species (plus 2 varieties and 3 forms) known to date, 26 species (plus 1 variety and 1 form) were illustrated.

The most frequently illustrated species are E. crista-galli, E. herbacea, E. speciosa, E. corallodendrum and E. americana.

Appendix IX

Chromosome numbers in American species of Erythrina

(Numbers (2,3,4,and 5) in parenthesis indicate the number of determinations of chromosome numbers in different individual plants).

I.	Fuscae	
	1. glauca	2n = 42 (3)
II.	Cristae-galli	
	2. crista-galli	2n = 42 (5); (2n=40;44)
	3. falcata	2n = 42 (2)
III.	Vernae	
	4. poeppigiana	---
	5. ulei	---
	6. dominguezii	2n = 42
	7. verna	---
	8. flammea	---
IV.	Speciosae	
	9. speciosa	2n = 42
V.	Edulis	
	10. polychaeta	---
	11. schimpffii	---
	12. edulis	---
VI.	Leptorhizae	
	13. breviflora	---
	13a. " fma. petraea	---
	13b. " " oaxacana	---
	14. leptorhiza	---
	15. horrida	---

16. montana	---
VII. Corallodendra	
17. peruviana	---
18. pallida	2n = 42
19. mitis	---
20. buchii	2n = 42
21. leptopoda	---
21a. elenae	---
22. eggersii	2n = 42
23. amazonica	2n = 84
24. similis	---
25. corallodendrum var. corallodendrum	---
25a. " var. bicolor	2n = 42
25b. " var. connata	---
VIII. Cubenses	
26. cubensis	---
26a. oliviae	---
IX. Herbaceae	
27. herbacea	2n = 42 (4); (2n=42)(2)
28. coralloides	---
29. flabelliiformis	2n = 42 (2)
30. lanata	---
32. berteriana	2n = 42 (3); 2n=42
32a. guatemalensis	2n = 42
33. americana	2n = 42
34. standleyana	2n = 42
35. chiapasana	---
36. goldmanii	2n = 42
37. rubrinervia	2n = 42 (2)
38. mexicana	2n = 42
39. lanceolata	2n = 42
40. hondurensis	---
41. gibbosa	---
43. costaricensis	---
44. folkersii	2n = 42

45. macrophylla	2n = 42
46. cochleata	---
47. chiriquensis	---
48. smithiana	---
X. Variegatae	
50. velutina	2n = 42 (2)
50a. velutina fma. aurantiaca	---
51. grisebachii	2n = 42

Notes

Out of 51 species (plus 2 varieties and 3 forms) known to date, as shown by the above table, chromosome counts have been published for 23 (and 1 variety). Out of 10 species-groups the chromosome numbers are known for one or more species from 7 groups. No chromosome counts have been published for any species of the groups *Edules*, *Leptorhizae* and *Cubenses*.

A 2n number of 42 chromosomes was found in all sampled American species (21 species and 1 form) except E. amazonica which is tetraploid with 2n = 84. Three other species and one variety in the group *Corallodendra*, to which E. amazonica belongs, have 2n = 42, and it would be interesting to learn the numbers for 6 other species (and 1 variety) of this group.

The chromosome numbers of 8 species were determined two or more times from different individual plants. These determinations not only substantiate the original counts but also emphasize the absence of polyploid races within the species. The constancy of chromosome numbers in the genus seems to indicate that gene mutation rather than polyploidy is responsible for the diversity of species in Erythrina.

Appendix X

Chromosome numbers in Asiatic-Polynesian and Australian species of Erythrina

Asiatic - Polynesian speciesI. Variegatae

1. E. variegata L. (= E. rostrata Ridley)
Sundar Rao, Y., Jour. Indian Bot. Soc. 24: n-21; 2n=42
42-44. 1945 (under the name "E. indica
Lam").
(Krukoff Herb. s.n.) (6:408), 2n = 42
Nanda, P.C. Jour. Indian Bot. Soc. 41: n = 21
271-277. 1962 (under the name "E.
indica Lam.").
2. E. merilliana Krukoff
3. E. euodiphylla Hasskark
4. E. boninensis Tuyama
5. E. tahitensis Nadeaud (= E. sandwicensis
Degener)

II. Subumbrantes

6. E. subumbrans (Hasskarl)Merrill

III. Fuscae

7. E. fusca Loureiro
(Krukoff Herb. 9308 from Siam) (6:408). 2n = 42
Mehra, P.N. & A.C. Hans, Taxon 18(3): n = 21
314. 1969.

IV. Arborescentes

8. E. arborescens Roxburgh
Mehra, P.N. & A.C. Hans, Taxon 18(3): n = 21
314. 1969.

V. Suberosae

9. E. suberosa Roxburgh
(Kermode s.n. (Krukoff Herb. 9862 from 2n = 42
Maymyo, Burma) (6:408).
Nanda, P.C. Jour. Indian Bot. Soc. 41: n = 21
271-277. 1962.
Mehra, P.N. & A.C. Hans, Taxon 18(3): n = 21
314. 1969.

10. E. microcarpa Koorders & Valetton (= E. stipitata
Merrill)
11. E. resupinata Roxburgh
12. E. stricta Roxburgh
13. E. mysorensis Gamble 2n=42
(coll. undesign. 253 from India) (6a:544).

Australian species

- I. Variegatae
14. E. vespertilio Bentham 2n=42
(Trist s.n. (Krukoff 15004) from Australia
(6:408)).
15. E. insularis F.M. Bailey
VI. Phlebocarpae
16. E. phlebocarpa F.M. Bailey

Notes

Of 16 species known to date the chromosome numbers were published for 6 species belonging to 4 species-groups. No counts have been published for any species of groups Subumbrantes and Phlebocarpae.

A 2n number of 42 chromosomes was found in all sampled Asiatic-Polynesian and Australian species (6 species). It would be important to determine the chromosome numbers for some species of groups Subumbrantes and Phlebocarpae for which no counts are available.

Appendix XI

Chromosome numbers in African species of Erythrina

Tropical African species

1. E. abyssinica Lamarck ex De Candolle
(Gardner s.n. (Krukoff Herb. 9359) from Kenya 2n=42
(6:408)).
2. E. burtii Baker fil.
(coll. undesign. 250 from Tanganyika) (6a:544). 2n=ca126

3. E. mildbraedii Harms (= E. altissima Chev.)
Mangenot, S. & Mangenot, G. Bull. Gard. Bot. Etat 2n=42
Brux. 28: 315-329. 1958.
4. E. senegalensis De Candolle
(Belime s.n. (Krukoff Herb. 9350) from French West 2n=42
Africa) (6:408)
Miege, J., Rev. Cytol. & Biol. Veg. 24: 149-164. 2n=42
1962 (Macina s.n. from Mali and Pont s.n. from
Senegal).
5. E. vogelii Hooker (= E. bancoensis Aubr. & Pell.)
Mangenot, S. & Mangenot, G., Bull. Gard. Bot. 2n=42
Etat Brux. 27: 639-654. 1957.

South African species

6. E. acanthocarpa E. Meyer
(Everitt s.n. (Krukoff Herb. 15156) from South 2n=84
Africa (6:408)
7. E. caffra Thunberg
(Martley s.n. (Krukoff Herb. 9348) from South 2n=42
Africa) (6:408).
8. E. humeana Sprengel (BEF. 10795-44) 2n=42
9. E. lysistemom Hutchinson
Riley, H.P., Jour. S. Afr. Bot. 26: 37-44. 1960. 2n=42
(coll. undesign.; from Kruger National Park).

Notes

Of approximately 32 known African species, the chromosome numbers have been published for 9 species. Atchison (6) in 1947 published counts for 5 species. From 1947 to 1966 the chromosome numbers of 4 additional species were published.

A 2n number of 42 chromosomes was found in all sampled African species (7 species) except E. acanthocarpa which is tetraploid with $2n = 84$ and E. burtii which is hexaploid with $2n = ca\ 126$. Additional determinations in African species would be of considerable interest.

Appendix XIICollections cited in the monograph and its supplements

	Mono- graph 10/1939	Suppl. I 10/1941	Suppl. II 11/1943	Sub- total	Suppl. III	Tot.
I. Fuscae						
1. glauca	133	19	13	165	126	291
II. Crista-galli						
2. crista-galli	98	33	4	135	72	207
3. falcata	52	21	4	77	60	137
III. Vernae						
4. poeppigiana	100	12	10	122	68	190
5. ulei	15	2	--	17	7	24
6. dominguezii	11	1	3	15	4	19
7. verna	13	3	2	18	18	36
8. flammea(1 with doubts)	5	1	--	6	1	7
IV. Speciosae						
9. speciosa	17	10	1	28	31	59
V. Edules						
10. polychaeta	2	--	--	2	2	4
11. schimpffii	5	1	--	6	7	13
12. edulis(1 with doubts)	51	6	5	62	65	127
VI. Leptorhizae						
13. breviflora	22	3	3	28	30	58
13a. " fma. petraea	5	--	--	5	--	5
13b. " fma. oaxacana	3	--	--	3	--	3
14. leptorhiza	39	1	1	41	29	70
15. horrida	14	1	--	15	--	15
16. montana	7	--	1	8	11	19
VII. Corollodendra						
17. peruviana	1	--	--	1	3	4

	Mono- graph 10/1939	Suppl. I 10/1941	Suppl. II 11/1943	Sub- total	Suppl. III	Tot.
18. pallida (1 with doubts)	17	1	8	26	10	36
19. mitis (1 with doubts)	6	4	--	10	15	25
20. buchii	5	--	--	5	1	6
21. leptopoda	8	--	--	8	--	8
21a. elenae	--	--	--	--	2	2
22. eggersii	12	14	--	26	--	26
23. amazonica	6	7	2	15	14	29
24. similis	3	--	--	3	--	3
25. corallodendrum var. corallodendrum (2 with doubts)	9	2	--	11	7	18
25a. corallodendrum var. bicolor	12	5	1	18	7	25
25b. corallodendrum var. connata (1 with doubts)	9	1	--	10	--	10
VIII. Cubenses						
26. cubensis	33	6	1	40	5	45
26a. oliviae	--	--	--	--	2	2
IX. Herbaceae						
27. herbacea (2 with doubts)	86	35	8	129	99	228
28. coralloides (3 with doubts)	23	4	2	29	19	48
29. flabelliformis	61	27	2	90	67	157
30. lanata	12	2	1	15	42	57
32. berteriana (4 with doubts)	167	26	20	213	80	293
32a. guatemalensis	---	4	2	6	6	12
33. americana (7 with doubts)	45	11	6	62	20	82
34. standleyana	26	10	1	37	3	40

	Mono- graph 10/1939	Suppl. I 10/1941	Suppl. II 11/1943	Sub- Total	Suppl. III	Tot.
35. chiapasana	2	--	--	2	14	16
36. goldmanii	4	--	--	4	3	7
37. rubrinervia	27	6	2	35	40	75
38. mexicana (1 with doubts)	9	5	5	19	13	32
39. lanceolata	21	--	5	26	14	40
40. hondurensis	11	--	--	11	6	17
41. gibbosa	15	2	11	28	13	41
43. costaricensis (1 with doubts)	35	9	6	50	40	90
44. folkersii	30	2	--	32	5	37
45. macrophylla	10	3	1	14	17	31
46. cochleata	4	--	--	4	5	9
47. chiriquensis	1	4	--	5	6	11
48. smithiana (1 with doubts)	9	--	--	9	20	29
X. Variegatae						
50. velutina	58	13	1	72	61	133
50a. velutina fma. aurantiaca	3	3	--	6	1	7
51. grisebachii	23	2	--	25	2	27
<u>TOTAL</u>	1395	322	132	1849	1193	3042

From this appendix we arrive at the following statistics. At the time when the monograph was published in 1939 the average number of collections per entity amounted to 24.9 collections. It increased to 33 collections in 1943 at the time when Supplement II was published and to 54.3 collections in 1968.

Five species, namely E. berteriana, E. glauca, E. poeppigiana, E. herbacea and E. crista-galli are much more frequently collected than all others. Excluding these

five from our calculations, we arrive at the following statistics. The average number of collections per entity in 1939 amounted to 14.4 collections, in 1943 - to 19.3 collections and in 1968 - to 32.7 collections.

Due to the showy flowers and the fact that many species of Erythrina are grown in hedges for living fence-posts or for ornamental purposes, American Erythrinas are better collected than many other groups of plants from the tropics. We may also conclude that satisfactory progress in the collections of Erythrina was made since 1939. Among collections made since 1943, particularly notable are the extensive ones from Central America by Standley, Steyermark, Molina, and others connected with the Field Museum of Natural History, Chicago, and those from western middle Mexico by McVaugh and others connected with the University of Michigan.

Appendix XIII

Changes in the Identifications

	Cited originally as	Cited later as
Cook & Griggs 407	(?) <u>macrophylla</u> (1:320)	<u>guatemalensis</u> (4:689)
Krukoff 7a	<u>costaricensis</u> (5:637)	<u>chiriquensis</u> (3rd. suppl.)
Standley 65712	<u>berteroana</u> (4:688)	<u>chiapasana</u> (3rd. suppl.)

It should be noted also that inasmuch as E. occidentalis was reduced to synonymy under E. lanata, and E. panamensis and E. colombiana were reduced to synonymy under E. costaricensis, all specimens originally cited under the above referred to three names, were renamed.

Appendix XIVCitations of places of deposit of specimens

The place of deposit of specimens is shown in this and my other papers on Erythrina by the following abbreviations:

- A: Arnold Arboretum, Harvard University, Cambridge. ****
B: Botanisches Museum, Berlin-Dahlem. *
BHM: Instituto Agronomico, Belo Horizonte. ** +
BL: Bailey Hortorium, Cornell University, Ithaca.*
BM: British Museum (Natural History), London. *** +
BRX: Jardin Botanique de l'Etat, Brussels. *** +
C: University of California, Berkeley. *
CAMP: Herbario do Instituto Agronomico do Estado de Sao Paulo, Campinas, Brazil. *
CAS: California Academy of Sciences, San Francisco. *
COL: Herbario Nacional Colombiano, Bogota. *** +
CR: Museo Nacional de Costa Rica, San Jose. *** +
CUZ: Universidad del Cuzco, Cuzco. *
D: Dudley Herbarium, Stanford University, Stanford.*
EAP: Escuela Agricola Panamericana, Honduras. ** +
EM: Escola Nacional Minas e Metal, Ouro Preto. ** +
ENCB: Instituto Politecnico Nacional, Mexico. ** +
ES: Estacion Experimental Agronomica, Habana. *
F: Field Museum of Natural History, Chicago. *** +
FI: Herbarium Universitatis Florentinae, Firenze. ** +
G: Conservatoire et Jardin Botanique, Geneve. *** +
GEORG: Georgetown Botanic Garden, Guiana. *
GH: Gray Herbarium, Harvard University, Cambridge. ****
HAK: Botanical Museum of Harvard University, Cambridge. ****
HB: Herbarium Bradeanum, Rio de Janeiro ** +
IAN: Instituto Agronomico do Norte, Para. ** +
INPA: Instituto Nacional de Pesquisas Amazonicas, Manaus. ***
K: Royal Botanic Gardens, Kew. *** +

- LA: University of California, Los Angeles. *
- LL: Lundell Herbarium, Renner. **
- M: Missouri Botanical Garden, St. Louis. *** +
- MD: Jardin Botanico, Madrid. *** +
- MEXU: Herbario Nacional, Universidad Nacional, Mexico. ** +
- MICH: University of Michigan, Ann Arbor. *** +
- MUN: Botanisches Museum, Munchen. *** +
- NY: New York Botanical Garden. *** +
- OUPr: Escola de Farmacia, Ouro Preto, Brazil. ** +
- P: Museum d'Histoire Naturelle, Paris. *
- PERN: Instituto Pesquisas Agronomicas, Recife. ** +
- PG: Museu Paraense Emilio Goeldi, Para. ** +
- PH: Academy of Natural Sciences, Philadelphia. *
- R: Museu Nacional, Rio de Janeiro. ** +
- RB: Jardin Botanico, Rio de Janeiro. ** +
- RO: Istituto Botanico, Citta Universitaria, Roma. ** +
- RUEB: Geobotanisches Institut der E.T.H., Zurich. ** +
- S: Naturhistoriska Riksmuseet, Stockholm. *** +
- SP: Departamento de Botanica do Estado, Sao Paulo. *** +
- TRIN: Trinidad Botanical Garden, Port of Spain. *
- TURIA: Universidad de Turrialba, Costa Rica. ** +
- U: Botanish Museum en Herbarium, Utrecht. ** +
- UB: Universidade de Brasilia, Brasilia. ** +
- US: U.S. National Herbarium, Washington. *** +
- VEN: Herbario Nacional de Venezuela, Caracas. *** +
- VIC: Escola Superior Agric., Vicos, Brazil. ** +
- W: Naturhistorisches Museum, Wien *** +
- WIS: University of Wisconsin, Madison **
- Y: Yale University, School of Forestry, New Haven *
- Z: Botanische Garten und Institut fur Systematische Botanik der Universitat Zurich ** +
- ZT: Institut fur Spezielle Botanik der Eidg. Technischen Hochschule, Zurich ** +

The abbreviation "Kr. Herb." stands for "Krukoff Herbarium". Specimens so designated are deposited at New York Botanical Garden.

No place of deposit is indicated when a particular collection is known only from New York Botanical Garden.

Photographs are cited only when the specimens were not seen.

Krukoff's collections are distributed to various herbaria. Their place of deposit is not indicated, as all are represented at New York Botanical Garden.

If the available material was inadequate for positive identification, the collection is preceded by an interrogation mark.

-
- * Specimens examined only in connection with the preparation of the monograph and the first two supplements in 1939 to 1943 (incl.) (15 herbaria).
 - ** Specimens examined only in connection with the preparation of Supplement III in 1964 to 1968 (incl.) (25 herbaria).
 - *** Specimens examined in 1939/1943 and again in 1964/1968 (19 herbaria)
 - + Herbaria visited in 1964/1968 (41 herbaria).

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Supplementary notes on the American species of *Strychnos*-X

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Introduction

Since the last serial paper was submitted for publication 132 new collections were examined, largely old collections deposited with Museum d' Histoire Naturelle, Paris and recent collections in Panama of botanists associated with Missouri Botanical Garden. An extensive collection of Romeu P. Belem made in the State of Bahia, Brazil early in 1968 is of particular interest. On this trip he made 36 collections which belong to 10 species. The earlier Froes' collection on which we reported in 1943 (2:21-24), the first Belem collections (on which we reported in 1969 (7b) and the present Belem collection give us fairly good information as to what species are found in this interesting area. It is to be recalled that some of the Amazonian species venture into the high riverine forests of eastern Bahia; species confined to caatingas of central Brazil, occur in the western part of the State and species of the southern coastal forests reach Bahia along the coast. It is regrettable that due to organizational difficulties Belem's trip was delayed by approximately 3 months. If he had started on this trip in January he would have collected many species of Strychnos in flower, rather than sterile or in fruit.

The newly examined collections extend our knowledge of some species previously known from incomplete material; extensions of ranges are noted for 12 species, 1 species (namely S. longisepala Krukoff) is reduced to synonymy, and the name Strychnos pedunculata (A. DeCandolle) Benth was replaced by the earlier name Strychnos bredemeyeri (Schultes) Sprague & Sandwith.

Chromosome Numbers

Considerable progress has been made in the studies of chromosome numbers in Strychnos. Twenty two species (1 American and 21 African and Asiatic) have been studied by Gadella: $2n = 44$ (20 species) and $2n = 88$ (2 species). In the opinion of Gadella it is likely that only one basic number occurs in the genus Strychnos: $x = 22$. The determination of the chromosome numbers was based on the study of roottip-mitoses. Roottips of the plants were fixed in Karpechenko, embedded in paraffin, sectioned at 15 micron and stained according to Heidenhain's haematoxylin method. (Th. W. J. Gadella. Some cytological observations in the Loganiaceae IV. Meded. Bot. Mus. Herb. Rijks. Utr. #265. 302-304. 1967).

Pollen Studies

Slides of pollen of 5 species prepared at the N. Y. Botanical Garden were sent to Polynological Laboratories, Stockholm for studies; pollen descriptions, as they were prepared by Dr. Siwert Nilssen of that laboratory are given below. From these descriptions it is evident that the pollens are very similar. Taking into consideration that the pollens were of one species each of section Longiflorae and Intermediae, and of subsections Breviflorae and Eriospermae of section Breviflorae also of S. parviflora which has no close relatives in the section Breviflorae, it is possible to conclude that specific differences, if such could be established on the basis of pollen, would require a very considerable amount of work.

Pollen descriptions:

Strychnos ramentifera (NY 1021) Ducke 1762 - Pollen grains 3-colpate or 3-colp-orate; largest diameter about $10\ \mu$. Apocolpia diameter about $12\ \mu$. Exine about $2.5\ \mu$ thick. Sexine as thick as nexine, finely reticulate with relatively wide muri.
NPC: 343 (345)

S. guianensis (NY 1023) Pires 48564 - Pollen grains 3-colp-orate (colp-oidate), prolate-spheroidal ($24 \times 23\ \mu$). Amb rounded-triangular. Apocolpia diameter about $7\ \mu$. Exine about $1\ \mu$ thick. Sexine as thick as nexine. Sexine pattern \pm ulmoid (LO-pattern).
NPC: 345 (343)

S. brasiliensis (NY 1022) Hassler 9645 - Pollen grains 3-colp-orate, oblate-spheroidal - prolate spheroidal ($23 \times 22\ \mu$). Amb rounded-triangular. Apocolpia diameter about $8\ \mu$. Exine thickness about $1\ \mu$. Sexine as thick as nexine, or thinner. Mesocolpia with LO-pattern. Apocolpia finely reticulate (lumina $< 5\ \mu$), or provided with a faint OL-pattern.
NPC: 345

S. schultesiana (NY 1025) Ereteler 3973 - Pollen grains 3-colp-orate, oblate-spheroidal ($17 \times 21\ \mu$). Amb \pm triangular. Apocolpia diameter about $8\ \mu$. Exine about $1\ \mu$ thick. Sexine as thick as nexine. Mesocolpia with LO-pattern. Apocolpia very finely reticulate, or provided with OL-pattern. Cf. S. brasiliensis.
NPC: 345

S. parviflora (NY 1024) Froes 21461 - Pollen grains 3-colp-oidate, \pm spheroidal ($17 \times 18\ \mu$). Apocolpia diameter about $9\ \mu$. Exine about $1.5\ \mu$ thick. Sexine as thick as nexine, or sexine $>$ nexine, finely reticulate.
NPC: 343-345

Longiflorae

1. Strychnos chlorantha Progel in Mart. Fl. Bras. 6(1):273. 1868.

Costa Rica: Puntarenas: open forest 1 mile due south of San Vito de Java, \pm 3500 ft., Raven 21903 (F) (Apr. Aug.).

This collection is welcome as it comes from the fourth locality in Costa Rica where this species was located. This is the first record of the species from the province of Puntarenas.

The fruits of this collection almost mature are \pm 2.2 cm in diam. and shells about 9 mm thick. This confirms our earlier observation that shells of fruits of S. chlorantha, in proportion to the size of fruits, are thicker than those of all known American species of Strychnos, including shells of fruits of S. froesii.

2. Strychnos ramentifera Ducke, Bull. Mus. Hist. Nat. Paris II. 4:745. 1932.

Brazil: Para: Belem: Ipean, Agua Preta, high forest on terra firme, Pires & Silva 11192. Maranhao: alto Turi, Tovares 1093 (US).

This is the first record of the species from the State of Maranhao.

4. Strychnos asperula Sprague and Sandwith, New Bull. 1927:131. 1927.

Brazil: Acre: man. Sena Madureira, France et al. 7598.

5. Strychnos romeu-belenii Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(1): 22. 1969.

Brazil: Bahia: Romeu Belem 3504, 3506 & 3509 (all from Marau, mata litoranea), 3710 (Una, mata costeira).

Fruits are said to be 10 cm in diam. The presence of tendrils in this species is now confirmed on the actual specimen.

6. Strychnos rondeletioides Spruce ex Benth, Jour. Linn. Soc. 1:104. 1856.

Brazil: Amazonas: Rio Urubu, France et al. 5074.

11. Strychnos trinervis (Velloso) Martius, Syst. Mart. Med. Bras. 121. 1843.

Brazil: Fritz Muller s.n. (P); Bahia: Romeu Belem 3573 (Pontal dos Ilheus); 3725 (Itabuna); Rio de Janeiro: Madeaud s.n. (Sept. 1862) (P); Sta. Catarina: Madeaud s.n. (Nov. 1862) (P).

12. Strychnos panamensis Seemann, Bot. Voy. Herald 166. 1854.

Panama: Canal Zone: Tyson & Blum 3570 (MO), Sister M. Victoria Hayden 17 (MO), Stoutanire 2102 (MICH), Croft 6028 (MO), 6694 (MO), 6826 (MO), 7266 (MO), 8182 (MO); Panama: Bartlett & Lasser 16425 (MO), Kirkbride & Duke 1652 (MO); Darien: Rio Chucanaquo, Duke 1987 (MO); Venezuela: Zulia: J. de Bruijn 1220, 1424.

15. Strychnos bahiensis Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(1):29. 1969.

Brazil: Bahia: Romeu-Belem 3484, 3500, 3510 & 3537 (Marau), 3581 (Pontal dos Ilheus), 3714 (Itabuna, Jucari), 3681 & 3706 (Una), 3472; Froes 12732 (munic. Ilheus, Bahia of Rio Santa Ana).

16. Strychnos eugenifolia Monachino, Phytologia 4:209. 1953.

French Guiana: Fleuve Approuague, Aldeman 2404 (P, U).

This is the first record of this species from French Guiana.

18. Strychnos medeola Sagot ex Frogel, Mart., Fl. Bras. 6(1):282. 1868.

Brazil: Para: Rio Jari, E. Oliveira 4229.

19. Strychnos toxifera Robert Schomburgk ex Benthams, Jour. Bot. Hook. 3:240. 1841.

Panama: Canal Zone: Croat 6766 (MO), 6925 (MO), 7278 (MO), 8558 (MO); San Blas: Elias 1747 (MO).

This is the first record of this species from the poorly collected San Blas.

20. Strychnos tomentosa Benthams, Jour. Linn. Soc. 1:104. 1856.

Surinam: near Jodensavanne, Vreden 11667 (U). French Guiana: Barbier s.n. (1847) (F), Lencine 7939.

23. Strychnos sandwithiana Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(1): 36. 1969.

Brazil: Rio de Janeiro: cult., Herb. Glaziou 9515 (P).

24. Strychnos jobertiana Baillon, Adansonia 12:367. 1879.

Brazil: Crevaux s.n. (P); Para: "Taperinha bei Santarem", Ginzberger 604 (FI); Amazonas: basin of Rio Tonantins, Jobert s.n. (P-type) (photo of Field Museum #28943). Colombia: Putumayo: Rio Putumayo, Schultes 3428 (GH). Peru: Huanuco: Mathias & Taylor 3988 (LA).

Local names: se-he-pa (Kofan).

Schultes states on the label: "bark of roots is strongest ingredient in Kofan curare poison". On the label of Jobert's specimen is written: "Curare de Kawichanes, extrait d' un groupe de Strychnos envoye du Bresil a M. Bert". This is the first record of this species from Huanuco, Peru.

25. Strychnos pseudo-guina A. St. Hilaire, Mem. Mus. Paris 9:240. 1822.

Brazil: Minas Geraes: Glaziou 15234 (P).

27. Strychnos amazonica Krukoff, Brittonia 4:284. 1942.

Brazil: Territ. Amapa: Rio Jari, Nilo T. Silva 1299.

The first record of the species from the Territory of Amapa.

28. Strychnos solimoesana Krukoff, Brittonia 4:280. 1942.

Brazil: Bahia: Romeu Belem 3503 (Marau, mata litoranea), 3703 (Una, mata costeira).

31. Strychnos peckii B.L. Robinson, Proc. Am. Acad. 49:504. 1913.

Costa Rica: 48 km SE from San Isidro, Alfonso Jimenez M. 3761 (F). Venezuela: Amazonas: Rio Casiquiare, B. Maguire et al. 41911, Wurdack & Adderley 43362. Brazil: Ferreira s.n. (F); Bahia: Romeu Belem 3470 (Marau, mata litoranea), 3576 (Pontal dos Ilheus).

32. Strychnos erichsonii Richard Schomburg, ex Progel in Mart. Fl. Bras. 6(1):274. 1868.

Panama: Darien: Duke 8782 (MO) (Rio Balsa), 14576 (MO), international highway ca 1 mile SE of Rio Tuira. Colombia: Valle: Rio Calima, Cuatrecasas 17531 (F); Amazonas/Vaupes: Rio Apaporis, Garcia-Barriga 11021. Peru: Loreto: near Contamana, Schunke 917 (F). Surinam: near Jodensavanne, Vreden 11707 (WAD), 11744. French Guiana: Lemoine 7858 (P) (Riviere Tampoc), J. Lenormand 1, Oldeman B-995 (P) (Fleuve Approuague). Brazil: Para: Belem, Ipean, "reserva Mocambo, 12-16", Fries & Silva 10643. Bahia: Marau: R. Belem 3460, 3497.

Local name: Taki-taki (Parouchaton, French Guiana).

This is the first record of this species from Panama, Valle (Colombia) and Peru. For identification of Ducke 1972 and 2032 see under S. mitscherlichii var. amazensis.

33. Strychnos gardneri A. DeCandolle, Prodr. 9:14. 1845.

Brazil: Rio de Janeiro: Glaziou s.n. (Sept. 10, 1878) (P).

35. Strychnos bredemeyeri (Schultes) Sprague & Sandwith, Kew Bull. 1927: 128. 1927.

Lasiostoma bredemeyeri Schultes, Mant. Syst. 3:64. 1827.

Rouhamon bredemeyeri A. DeCandolle in DeCandolle, Prodr. 9:18. 1845.

Rouhamon pedunculatum A. DeCandolle in DeCandolle Prodr. 9:561. 1845.

Strychnos schomburgkiana Klotzsch ex Richard Schomburgk, Reisen 3: 114. 1848. nomen.

Strychnos pedunculata (A. DeCandolle) Bentham, Jour. Linn. Soc. 1:105. 1856.

Strychnos trinitensis Grisebach, Fl. Brit. W. Ind. 407. 1861.

Strychnos bredemeyeri (Schultes) Badillo in Pittier et al., Cat. Fl. Venezolana 2:287. 1947. (3rd Conf. Interam. Agric. Caracas).

Recently we received a letter from Botanischer Garten und Museum, Berlin-Dahlem informing us that there is no specimen in Willdenow herbarium of Strychnos collected by Jacquin in Venezuela which could be considered as the type of Lasiostoma bredemeyeri Schultes. Under the circumstances Bredemeyer s.n. (Hb. Jacq.) (W) must be considered as the type of Lasiostoma bredemeyeri Schultes. In 7a:50 we already stated that the above referred to specimen unquestionably is conspecific with S. pedunculata.

- 36a. Strychnos mitscherlichii Richard Schomburgk, Reisen 2:451. 1848, var. mitscherlichii.

Surinam: Jodensavanne, Vreden 11734. Brazil: Territ. Rondonia: France et al. 8850 (savanna forest). Peru: Loreto: prov. Coronel Portillo, Schunke 2789 (F).

This is the first collection of this variety from Peru, and from Territ. Rondonia, Brazil.

Reference is made to the extensive chemical studies of bark, supposedly of S. mitscherlichii, by Karrer, Schmid and their coworkers. (7a:53). The authors give the following information on the procurement and identification

of the sample and botanical specimen (86) "Durch die Fréundlichkeit von Padre Antonio Giaccone (Brasilien) erhielten wir Rinde einer Strychnosart, die Herr Prof. A. Frey-Wyssling, Zurich Eid. Techn. Hochschule, als der S. mitscherlichii-Gruppe angehörend identifizierte".

At my request, Dr. H. Hurlimann of Ciba Limited, Basle, Switzerland, talked with Prof. Frey-Wyssling who does not remember having identified any Strychnos for Prof. Karrer and he is quite definite that he has never studied any herbarium specimen of this genus. He suggested that it might have been possible that he looked at a bark sample, comparing the anatomical characters with other material which they may have had in their collection of fruits, wood, etc.

Inasmuch as on my visit to Zurich in 1968, I failed to find any herbarium material of Strychnos which could be a voucher for a sample of bark studied by Karrer, Schmid and their coworkers - the conclusion must be reached that no voucher is available, and also that the identity of this plant is doubtful.

36c. Strychnos mitscherlichii var. amapensis Krukoff & Barneby, Erittonia 20(1):18. 1969.

Brazil: Para: Belem, Ipean, Pires & Silva 10779.

Ducke 1972 and 2032 are cited under this species (7b:19). It should be noted here that two different collections were labelled as "1972", one made on 26/9-1944 and another on 24/5-1946; two collections also were labelled as "2032", one made on 26/10-1944 and another on 26/11-1946. We have seen material of S. mitscherlichii var. amapensis distributed under two above referred to numbers and we also have seen material of S. erichsonii distributed under the two above referred to numbers, sometimes on a single sheet. Ducke apparently did not know S. erichsonii, which is obvious from his own statement (31:29): "E. erichsonii e uma das poucas especies amazonicas que nao conheço em estado vivo, apesar de ocorrer com frequencia em Sao Miguel do Guama, nao muito longe de Belem".

38. Strychnos darlensis Seemann, Bot. Voy. Herald. 166. 1854.

Costa Rica: Puntarenas: peninsula de Osa (swampy forest), Alfonzo Jimenez K 3026 (F).

Intermediae

39. Strychnos guianensis (Anblot) Martius, Syst. Mart. Bras. 121. 1843.

French Guiana: Oldeman 947 (P) (Fleuve Approuague), Francis Halle 735 (P) (A. Mana). Venezuela: Amazonas: Farfán L. et al. 800 (Rio Casiquiare), Wurdack & Adderley 12659 (Rio Atabapo). Brazil: Territ. Rondonia: basin of Rio Madeira, France et al. 5568, 5533, 5810.

This is the first record of this species from the Territory Rondonia.

40. Strychnos glabra Sagot ex Progel, Mart. Fl. Bras. 6(1):275. 1869.

Venezuela: S. Martin s.n. (1879) (P). Brazil: Para: Rio Jari, E. Oliveira 1208.

On the label of the specimen from Venezuela is stated that the plant is used in Curare.

43. Strychnos panurensis Sprague & Sandwith, Kew Bull. 1927:132. 1927.

Panama: Panama: Blum et al. 2271 (MO), Dwyer 7092 (MO), Correa & Dressler 725 (halfway between Cerro Jefe and La Zneida), Dwyer et al. 7287 (MO) and 7373 (MO) (Cerro Jefe, ± 2900 ft.). Brazil: Acre: Sena Madureira, France et al. 7860. Peru: Loreto: near Neschuya, Schunke 897 (F), 6650 (MO). Venezuela: Amazonas: Rio Orinoco, Wurdack & Adserley 43072.
This is the first record of this species from Panama.

46. Strychnos hirsuta Spruce ex Benth, Jour. Linn. Soc. 1:106. 1856.

Brazil: Para: Belen, Pires 8113 (cult.).

48. Strychnos melinoniana Baillon, Bull. Soc. Linn. Paris 1:256. 1880.

Surinam: Borsboom 12036 (WAD), Lanjouw and Lindeman 2775 (U).

Breviflorae Subsection Breviflorae

52. Strychnos oiapocensis Froes, Bol. Tecn. Inst. Agron. Norte 36:143. 1959.

French Guiana: Francis Halle 1135 (P) (Mont. Cacao), Louis Claude Richard s.n.

This is the first record of this species from French Guiana.

54. Strychnos atlantica Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(1): 61. 1969.

Brazil: Bahia: Itabuna, Jucari, Romeu Belem 3712, 3722, 3723, 3724, 3726.

All these collections are from erect shrubs 3 to 5 m high with trunks armed with long straight spines and with the branchlets provided with woody hook like tendrils.

56. Strychnos parvifolia DeCandolle, Prodr. 9:16. 1845.

Brazil: Bahia: Romeu Belem 3607 & 3622 (margem do Rio Pardo), 2704 (Una, margem do Rio Raphael); Rio de Janeiro: "pres d'Aldeia de S. Pedro, Herb. Glaziov s.n. (Sept. 1881) (P); Sao Paulo: Dedecca 583 (UC).

58. Strychnos acuta Progel, Mart. Fl. Bras. 6(1):280. 1868.

Brazil: Bahia: vale do Rio Mucuri, Romeu Belem 3880; Espirito Santo: Linhares, vale do Rio Doce, Romeu Belem 3808, 3811.

This is the first record of the species from Bahia.

59. Strychnos brasiliensis (Sprengel) Martius, Flora 24 (Eichl. 2):84. 1841.

Brazil: Fritz Muller 45 (US), s.n. (P); Minaes Geraes: Schwacke 6265 (P); Rio de Janeiro: Glaziov 2706 (P); Sao Paulo: Dedecca 583 (UC); Parana: Curitiba, Hatschbach 16086 (P); Sta. Catarina, Ule 1529 (P). Argentina: Misiones: Candelaria, Montes 27489. Bolivia: Santa Cruz: San Ignacio do

Velasco, Cardenas 5642 (US).

Breviflorae Subsection Eriospermae

64. Strychnos nigricans Progel in Mart. Fl. Bras. 6(1):280. 1868.

Brazil: Bahia: Romeu Belem 3512 (Marau, mata litoranea), 3708 (Una, mata costeira), 3713 (Jucari, Itabuna, mata pedrigosa), 3874 (vale do Rio Mucuri, mata de terra firme); Rio de Janeiro: Corcovado, Wadeau s.n. (P).

65. Strychnos mattogrossensis S. Moore, Trans. Linn. Soc. II. 4:302. 1895.

Venezuela: Zulia: Perija district, J. de Bruijn 1217.

67. Strychnos schultesiana Krukoff, Mem. N.Y. Bot. Gard. 12(1):78. 1965.

Chromosome numbers: 2n=44. Voucher: Breteler 5193 (Wageningen) from Venezuela, near La Azulita, State Merida (Th. W. J. Gadella, Meded. Bot. Mus. Herb. Rijks Utr. #265, p. 303. 1967). We accept the identification of this plant by Breteler without reservation as he knew this species and collected specimens of it (Breteler 3973, 4940 & 4591 (7b:74)).

69. Strychnos poeppigii Progel in Martius. Fl. Bras. 6(1):282. 1868.
Strychnos longisepala Krukoff, Brittonia 4:317. 1942.

Brazil: Acre: munic. Sena Madureira, Prance et al. 7834.

With the acquisition of more material the supposed differences in the calyx of S. poeppigii and S. longisepala has broken down. Length and discoloration are no longer correlated. No further inflorescence with peduncle as long as that of the original S. poeppigii has been seen, but it seems doubtful whether the character is significant, weighed in balance against the resemblances in corolla, calyx, and fruit. Collectively S. poeppigii and S. longisepala, which should now bear the former name, have a wide distribution in the upper Amazon basin. Although the calyx varies somewhat in length, the lobes seem to be decisively longer than in the otherwise very similar and closely related S. tarapotensis. The less closely related S. malacosperma and S. schultesiana may be distinguished at anthesis by their looser inflorescences and even more certainly by the much larger, thick-shelled fruits.

Appendix VII (Supplement) (Cont'd)

Changes in the identifications

	Cited originally as	Cited later as
Proes 12732 (sterile)	<u>S. trinervis</u> (2:22)	<u>S. bahiensis</u> (10th suppl.)
Belem 3706 (sterile)	<u>S. trinervis</u> (7c:96)	<u>S. bahiensis</u> (10th suppl.)
Duke 14576	<u>S. peckii</u> (7b:42)	<u>S. erichsonii</u> (10th suppl.)

Inasmuch as S. longisepala was reduced to synonymy under S. poeppigii in this paper, all collections originally cited under S. longisepala (17 collections) were renamed as S. poeppigii.

Corrections

- 1:302 (Panure by the Rio Uaupes) not "Panura".
 7a:81 Edmundo Sesmero not "Edmundo Gesmero".
 7b:6 8. S. barnhartiana not "8. S. baenhartiana".
 7b:29 omit "from the State of Bahia" (under S. divaricans).
 7b:49 G.B. Marini-Bettolo not "G.B. Matini-Bettolo".
 7b:55 Marino (in two places) not "Marino".
 7b:58 50. S. castelnaeana Weddell in Castelnau not Weddell ex Castelnau.
 7b:77 S. atlantica (in two places) not "S. littoralis".
 7b:78 S. atlantica not "S. littoralis".
 7b:82 (type coll.) not "(type cell.)".
 7b:86 omit "divaricans" under State of Bahia.
 7b:86 (11 + 0) under State of Bahia, not "(12 + 0)".
 7b:87 11 under State of Bahia, not "12".
 7b:88 S. atlantica not "S. littoralis".
 7c:96 18. S. medecia Sagot ex Progel not "Sagot (Progel)".
 7c:98 41. S. subcordata Spruce ex Bentham not "(Spruce) Bentham".
 7c:99 56. S. parvifolia not "57. S. parvifolia".

Bibliography

(In order to conserve space, we are citing here only the papers which are not cited in Supplements #VII, VII & IX).

- 7b. Krukoff, B.A. & R.C. Barneby. Supplementary notes on the American species of Strychnos VIII. Mem. N.Y. Bot. Gard. 20(1):1-93. 1969.
 7c. Krukoff, B.A. & R.C. Barneby. Supplementary notes on the American species of Strychnos IX. Mem. N.Y. Bot. Gard. 20(1):94-99. 1969.

TWO VARIETAL TRANSFERS IN CARYA (HICKORY)

ELBERT L. LITTLE, JR.

Two new combinations of varietal rank in the genus Carya Nutt. (hickory), family Juglandaceae, are made here. The reduction of Carya leiodermis Sarg., swamp hickory, to synonymy is confirmed also.

At the turn of the century and during the first quarter of the twentieth century, two specialists were very active independently in naming novelties of trees in eastern United States. Charles Sprague Sargent (1841-1927), director of the Arnold Arboretum of Harvard University, had just completed his monumental, beautifully illustrated 14-volume "Silva of North America" (1890-1902). This was condensed as his "Manual of the Trees of North America (Exclusive of Mexico)" (1905; Ed. 2, 1922; Ed. 2, corr., 1926).

William Willard Ashe (1872-1932), forester with the United States Forest Service and earlier with the North Carolina Geological Survey, wrote about 60 articles in systematic botany and dendrology, mostly on woody plants of the Southeast. "An indefatigable observer, collector, and annotator of plants," he published 510 new botanical names under 35 genera, according to a biographical note by William A. Dayton (William Willard Ashe, pioneer in southern forestry. Jour. Forestry 44: 213-214, portr. 1946).

Most taxa proposed by the two men in that period have been rejected by later workers and reduced to synonymy. In the genus Crataegus L. (hawthorn), Sargent named about 700 species and Ashe nearly one-fourth as many, about 165. The result was taxonomic chaos. Finally, Gleason and Cronquist (Man. Vasc. Pl. NE. U. S. 389-393. 1963) in a "drastic condensation" accepted only 21 species in the Northeast.

The independent efforts of Sargent and Ashe in the genus Tilia L. (basswood or linden) came to naught after producing confusion for nearly one-half century. Besides varieties, Sargent published 10 binomials in Tilia, and Ashe, 8. In his recent conservative monograph, George Neville Jones (Taxonomy of American species of linden (Tilia). Ill. Biol. Monogr. 39, 156 p., illus. 1968) accepted only 3 species in this genus for the United States, the same 3 species in Sargent's "Silva of North America" (1: 49-58, illus. 1890).

These two specialists fared slightly better in the difficult and variable genus Carya Nutt., nom. conserv. (hickory), formerly also Hicoria Raf. Under the latter name, Sargent described and illustrated 9 species (1 afterwards changed to a hybrid) in his "Silva of North America" (7: 131-167, illus. 1895; 14: 43-44, illus. 1902). However, under Carya the number of species was expanded to 15 in his "Manual of the Trees of North America (exclusive of Mexico)" (Ed. 2, corr. 176-200. 1926).

Besides many varieties and hybrids and several forms, Sargent named 4 species in Carya and revived 1. Ashe named 7 species all in Hicoria and raised 1 of Sargent's varieties to specific rank, also transferring some names to Hicoria. Of these, only Carya floridana Sarg., C. pallida (Ashe) Engl. & Graebn., and the 2 here reduced to varieties, survive as species.

After the name Hicoria was finally dropped by followers of the American Code, a check of the nomenclature was made (Little, Notes on the nomenclature of Carya Nutt. Amer. Midland Nat. 29: 493-508. 1943). One species was reduced to a hybrid by Ernest J. Palmer (Arnold Arboretum Jour. 18: 133-135. 1937) and was renamed Carya Xlecontei Little (C. aquatica X illinoensis). "Check List of Native and Naturalized Trees of the United States" by Little (U. S. Dept. Agr., Agr. Handb. 41: 80-92. 1953) accepted 12 species in Carya, 1 with 2 varieties, and 8 binomials for hybrids. Most other names including those in current use and those published after 1920 were cited in synonymy.

Donald E. Stone, George A. Adrouny, and Robert H. Flake (New World Juglandaceae. II. Hickory nut oils, phenetic similarities, and evolutionary implications in the genus Carya. Amer. Jour. Bot. 56: 928-935, illus. 1969; p. 929) in a world-wide listing of the taxa of Carya accepted 18 species, 4 of these known only from southeastern Asia, 1 confined to Mexico, and 13 native in the United States. These authors (p. 930) excluded Carya leiodermis Sarg., considering it synonymous with C. glabra (Mill.) Sweet.

I wish to confirm the reduction of Carya leiodermis Sarg. (Bot. Gaz. 66: 239. 1918), swamp hickory, to synonymy. Recently at the Arnold Arboretum I examined the type specimen (C. S. Sargent, Oct. 11, 1913, Little Bayou Têche, East of Opelousas, La.). That herbarium has many sheets so identified, mostly by Sargent, from northern Florida (Levy County), western Alabama, Mississippi, Louisiana, and eastern Texas (Jefferson County). These specimens are scarcely different from C. glabra including its large-fruited variety, var. megacarpa (Sarg.) Sarg. However, the young twigs and rachis are often slightly puberulous, and the leaflets slightly puberulent along midrib and lower surface and ciliate. Specimens from southern Arkansas referred to C. leiodermis by its author have been annotated recently by Wayne E. Manning as C. texana Buckl.

- CARYA OVATA** (Mill.) K. Koch var. **AUSTRALIS** (Ashe) Little, comb. nov. Carolina hickory
- Hicoria carolinae-septentrionalis Ashe, Notes on Hickories 1. 1896.
- Carya carolinae-septentrionalis (Ashe) Engl. & Graebn. in Engl., Berlin K. Bot. Gart. u. Mus. Notizbl., App. 9: 19. 1902.
- Carya australis Ashe, Charleston Mus. Bul. 14: 12. 1918.
- Hicoria australis (Ashe) Ashe, Elisha Mitchell Sci. Soc. Jour. 34: 133. 1918.
- Hicoria carolinae-septentrionalis var. australis (Ashe) Ashe, Elisha Mitchell Sci. Soc. Jour. 40: 46. 1924.

This southern variation with small fruits and narrow leaflets is accepted here as a variety of Carya ovata (Mill.) K. Koch (Dendrol. 1: 598. 1869), shagbark hickory (basionym Juglans ovata Mill., Gard. Dict. Ed. 8, Juglans No. 6. 1768). Carya carolinae-septentrionalis (Ashe) Engl. & Graebn., Carolina hickory, is treated as a species by some authors. However, it was united with C. ovata by Robinson and Fernald (Gray's New Man. Bot. Ed. 7, 331. 1908) as a small-fruited extreme of that species and was retained as a synonym in the 1953 Check List.

Hicoria carolinae-septentrionalis Ashe was published as a new species of shagbark hickory with a 4-line English description. Two other new species, a new variety, and a new combination, all were on one printed sheet dated at the bottom, Chapel Hill, N.C., Apr. 15, 1896. A handwritten note on a library copy explains that this paper was read before the Elisha Mitchell Scientific Society and was distributed at the meeting. Incidentally, Hicoria pallida Ashe, another species published on that sheet, is currently accepted as Carya pallida (Ashe) Engl. & Graebn., sand hickory. The next year Ashe (A new hickory--Hicoria pallida. Gard. and For. 10: 304-306, illus. 1897) published a detailed description with a large accurate drawing by himself, displaying his professional artistic skill.

In their study of hickory nut oils, Donald E. Stone, George A. Adrouny, and Robert H. Flake (Amer. Jour. Bot. 56: 928-935. 1969) stated: "On morphological grounds, Carya ovata and C. carolinae-septentrionalis are virtually indistinguishable. In fact, the latter taxon is sometimes reduced to varietal rank under C. ovata." In chromosome number those authors listed as diploids both species and C. laciniosa (Michx. f.) Loud. of Carya sect. Carya, also all species of Carya sect. Apocarya C. DC. All other species of Carya sect. Carya, including C. glabra and C. ovalis, mentioned below, were tetraploids.

Apparently only one epithet is available for this taxonomic group at the rank of variety. Carya australis Ashe was described originally as closely related to C. carolinae-septentrionalis and afterwards was united by its author as a variety of the latter.

- CARYA GLABRA** (Mill.) Sweet var. **ODORATA** (Marsh.) Little, comb. nov. red hickory
- Juglans alba odorata Marsh., Arbustr. Amer. 68. 1785.
- Juglans ovalis Wangenh., Beytr. Deutsch. Holzger. Forstwiss. Nordamer. Holz. 24, pl. 10, fig. 23. 1787; as "Juglans ovalis."
- Juglans alba yodorata (Marsh.) Castiglioni, Viag. negl. Stati Uniti 2: 262. 1790.
- Hicoria odorata (Marsh.) Dippel, Handb. Laubholzk. 2: 332, fig. 153. 1892.
- Hicoria glabra var. odorata (Marsh.) Sarg., Silva No. Amer. 7: 167, pl. 354. 1895.
- Carya ovalis (Wangenh.) Sarg., Trees and Shrubs 2: 207. 1913.
- Carya ovalis var. odorata (Marsh.) Sarg., Trees and Shrubs 2: 208. 1913.
- Hicoria ovalis odorata (Marsh.) Ashe, Elisha Mitchell Sci. Soc. Jour. 34: 134. 1918.

The new combination published above is accepted here for the taxon Carya ovalis (Wangenh.) Sarg. (Trees and Shrubs 2: 207. 1913). This binomial was established by Sargent in 1913 for a segregate of C. glabra (Mill.) Sweet (Hort. Brit. 97. 1827), pignut hickory (basionym Juglans glabra Mill., Gard. Dict. Ed. 8, Juglans No. 5. 1768). Sargent (Bot. Gaz. 66: 245. 1918) stated further under C. ovalis: "This is the oldest name which can be used for the small-fruited hickories with globose or pear-shaped fruit opening usually as soon as ripe to the base generally by the 4 sutures of the thin involucre, and often with slightly scaly bark. The type of this tree and its varieties have glabrous or rarely slightly pubescent leaves, with usually 7 thin leaflets...." Other binomials applied to this small-fruited hickory are: Carya microcarpa Nutt. (Gen. No. Amer. Pl. 2: 221. 1818) and Hicoria microcarpa (Nutt.) Britton (Torrey Bot. Club Bul. 15: 283. 1888).

The basionym, Juglans alba odorata Marsh., is the oldest name with rank of variety that has been applied to this taxon. Though brief, the original description noted, "The nuts are small, round, and thin shelled, the kernel sweet." This variety was further defined and illustrated when taken up as Hicoria glabra var. odorata (Marsh.) Sarg. (Silva No. Amer. 7: 167, pl. 354. 1895).

When he revived Wangenheim's epithet, Sargent (Trees and Shrubs 2: 207-209. 1913) distinguished besides the typical element of Carya ovalis (Wangenh.) Sarg. 3 varieties, var. odorata (Marsh.) Sarg., var. obcordata (Muhl. & Willd.) Sarg., and var. obovalis Sarg. For the combined group as a variety of C. glabra, Marshall's epithet, the oldest, has been adopted here.

Notes on these hickories and the taxonomic problems were made by Wayne E. Manning (A key to the hickories north of Virginia with notes on the two pignuts, Carya glabra and C. ovalis).

Rhodora 52: 188-199. 1950). Discussing the variations, he noted the difficulty in separating C. glabra and C. ovalis except with completely mature fruit collected in November.

Carya ovalis was reduced to a synonym of C. glabra in the Check List (Little, U. S. Dept. Agr., Agr. Handb. 41: 83-84. 1953). As noted, the principal difference is in the husk of the fruit, opening late and partly or remaining closed in C. glabra but promptly splitting to the base in C. ovalis, but many trees have intermediate fruits. Also, the recorded ranges are almost the same. In other taxonomic groups, length of a line of dehiscence is a character of minor value.

Carya ovalis has been treated also as an interspecific hybrid between C. glabra and C. ovata, for example, by Bernard Boivin (Énumération des plantes du Canada. Naturaliste Canadien 93: 432-433. 1966). Henry A. Gleason (New Britton Brown Illus. Fl. NE. U. S. 2: 30. 1952) accepted C. ovalis as a polymorphic species especially variable in the size and shape of its nuts and possibly a hybrid. The recent detailed chemical analyses of hickory nut oils by Stone and others cited above suggest that the relationships may be more complex after a long and reticulate phylogeny.

In summary, 11 species of Carya Nutt. (hickory), 2 with varieties, are accepted here as native in the United States, after reduction of 1 to synonymy and 2 to varieties. These species are the same as in the 1953 Check List except for the deletion of C. leiodermis Sarg. The list follows:

Carya sect. Apocarya C. DC.

Carya aquatica (Michx. f.) Nutt., water hickory

Carya cordiformis (Wangenh.) K. Koch, bitternut hickory

Carya illinoensis (Wangenh.) K. Koch, pecan

Carya myristiciformis (Michx. f.) Nutt., nutmeg hickory

Carya sect. Carya

Carya floridana Sarg., scrub hickory

Carya glabra (Mill.) Sweet, pignut hickory

Carya glabra var. glabra, pignut hickory (typical)

Carya glabra var. megacarpa (Sarg.) Sarg., coast pignut hickory

Carya glabra var. odorata (Marsh.) Little, red hickory

Carya laciniosa (Michx. f.) Loud., shellbark hickory

Carya ovata (Mill.) K. Koch, shagbark hickory

Carya ovata var. ovata, shagbark hickory (typical)

Carya ovata var. australis (Ashe) Little, Carolina hickory

Carya pallida (Ashe) Engl. & Graebn., sand hickory

Carya texana Buckl., black hickory

Carya tomentosa Nutt., mockernut hickory

CERTAMEN MELASTOMATACEIS XIV.

John J. Wurdack

U. S. National Herbarium, Smithsonian Institution

TIBOUCHINA KINGII Wurdack, sp. nov.

Sect. Diotanthera. T. ciliari (Vent.) Cogn. affinis, inflorescentiarum hypanthiorumque pilis eglandulosis longioribus differt.

Suffrutex 0.5-1 m altus; ramuli rotundo-quadrangulati sicut inflorescentia modice setosi, pilis laevibus gracilibus 1.5-2 (-3) mm longis eglandulosis. Petioli 0.5-2 cm longi; lamina 4-7 X 2-3.5 cm oblongo-lanceata, apice acuto vel paullulo gradatimque acuminato basi obtusa, membranacea et obscure serrulata, supra modice appresso-setosa pilis gracilibus apicibus liberis ca. 1.5 mm longis, subtus sparsiuscule vel modice appresso-setulosa pilis ca. 1-1.5 mm longis, 5-nervata, nervis primariis exterioribus basaliter ca. 1-2 mm coalitis. Panicula submultiflora 6-9 X 5-8 cm, bracteis plerumque 2-3 X 1.5-2 mm, bracteolis 1-2 X 1-1.5 mm persistentibus, pedicellis 2-4 mm longis; flores 5-meri. Hypanthium (ad torum) 5 mm longum extus sparsiuscule vel modice appresso-setosum, pilis gracilibus (0.5-)1-1.5 mm longis; calycis tubus 0.2-0.3 mm longus, lobis 2.5-2.7 X 1.7-1.9 mm oblongo-ovatis modice ciliolatis extus sparse appresso-setulosis intus glabris. Petala (10.5-)12-17 X (7.5-)9-14 mm obovata, apice rotundato-truncato, densiuscule ciliolata pilis eglandulosis alioqui glabra. Stamina paulo dimorphica glabra; filamenta 5.6-6 vel 4.3-5 mm longa; antherarum thecae subulatae 6-6.2 vel 4.8-5 X 0.7-0.8 mm, connectivo 1-1.5 vel 0.4-0.5 mm prolongato in staminibus maioribus interdum dorsaliter minute tuberculato, lobis ventralibus plerumque inflatis 0.7-0.8 X 0.6-0.8 mm vel 0.5-0.6 X 0.4 mm. Stigma punctiforme; stylus 10 X 0.5 mm glaber; ovarii apex modice strigosus, pilis gracilibus laevibus 0.3-1 (-1.5) mm longis.

Type Collection: R. M. King, A. E. Guevara, & Enrique Forero 5999 (holotype US 2559560; isotype COL), collected about 18 km west-southwest of Fresno, Cordillera Central, Depto. Tolima, Colombia, elev. 2150 m, 16-17 July 1965. "Abundant small shrubs up to 1 m tall; flowers light lavender."

Paratypes (all Colombia, elev. 1600-2500 m): Antioquia: Vicinity of Medellín, F. Hernandez s. n.; Santa Elena, Scolnik, Peláez, & Araque 528 (corolla pink); Capiro, Bro. Daniel 496; Amaga, Bro. Daniel 4266 (corolla white); Río Negro, Archer 274 (corolla pink), 275 (corolla white); La Ceja, Uribe 4176 (corolla white); La Unión, Uribe 4187 (corolla white); road to Santo Domingo, Barkley & Barkley 38C514 (corolla pink). Tolima: 18 km west-southwest of Fresno, King, Guevara, & Forero 6003 (corolla white). Cundinamarca: 2 km northwest of Choachi, King, Guevara, & Forero 5913 (corolla white).

Tibouchina ciliaris has gland-tipped inflorescence and hypanthial hairs ca. 1-1.2 mm long, leaf blades rounded to cordulate at the base without a triangular protraction, and somewhat smaller flowers, but similar calyx and stamens. In Cogniaux' monograph, T. kingii would probably key to T. scabriuscula (Schlecht.) Cogn., T. monticola (Naud.) Cogn., and T. ferrariana Cogn., all of which have narrow calyx lobes. Another possibility in Cogniaux' system is T. geitneriana (Schlecht.) Cogn. [including T. moritziana (Triana) Cogn.], which has lance-subulate calyx lobes and shorter appressed cauline (ca. 1 mm long) and lower leaf surface (ca. 0.8 mm long) hairs, but similar stamen connectives. No type material of T. schumannii Cogn. has been seen, but from the Macbride photograph (16794) and description, the appressed short cauline pubescence, shorter foliar hairs, and narrower (ca. 1 mm wide) calyx lobes differentiate the Colonia Tovar material; actually T. schumanniana is probably a synonym of T. geitneriana, Cogniaux not having examined the Geitner collection at Wien. The older collections of T. kingii had been variously identified as T. ciliaris, T. longifolia (Vahl) Baill., and T. gracilis (Bonpl.) Cogn. While T. gracilis is a polymorphic species, the northern South American collections all have narrowly oblong inflorescences, much larger dichasial bracts, densely sericeous-ciliolate calyx lobes 6-8 mm long, and almost isomorphic stamens with ventral connective lobes not appreciably inflated; individual characters above-cited do not apply to the austral populations of T. gracilis, but the general correlation of features will differentiate T. kingii. King collected viable seed from the Tolima plants; plants since grown and flowered in Beltsville have furnished meiotic chromosome numbers to be reported elsewhere. The two forms with pink and white corollas each came true from King's seed; seedlings from the Beltsville plants have been produced abundantly indoors. The species has considerable horticultural merit, of easy culture and flowering several times annually.

ADELOBOTRYS STENOPHYLLA Wurdack, sp. nov.

A. duidae (Gleason) Wurdack affinis, foliis trinervatis angustioribus supra non persistenter robusti-strigosis differt.

Ramuli sicut foliorum venae primariae subtus inflorescentia hypanthiaque dense pilis gracillimis rufescentibus appressis 1-2 (-3) mm longis induti tarde glabrati. Petioli 0.3-0.6 cm longi; lamina 2.5-5 X 0.5-1 cm anguste oblongo-elliptica utroque acuta, rigidiuscula et densiuscule pilis rigidiusculis 2-2.5 mm longis appresso-ciliatis, utrinque in superficie primum pilis gracillimis ca. 1-1.5 mm longis appressis induta mox glabrata, triner-vata nervis secundariis supra invisibilibus subtus planis ca. 1.5 mm inter se distantibus nervulis non evolutis. Inflorescentia terminalis ca. 1.5 cm pedunculata, floribus 3-5 subumbellatim aggregatis (alabastris fructibus dehiscentibus solum cognitis), pedicellis in alabastris ca. 4 mm longis. Hypanthium (ad torum) ca. 4 mm longum in pedicellum sensim attenuatum; calycis tubus 0.6 mm altus, lobis interioribus 2.3 X 2.7 mm suborbicularibus

paulo imbricatis, dentibus exterioribus lobos interiores aequantibus ob pilos occultis. Petala oblongo-elliptica glabra. Stamina dimorphica glabra; thecae subulatae 4.8 vel 2.9 mm longae, connectivi dente basali 0.3 vel 0.15 mm longo appendice dorsali ascendente 1.4 vel 1.5 mm longa ad apicem paulo (0.1-0.2 mm) bilobulato lobis hebetibus. Ovarium triloculare glabrum, apice paulo (0.3 mm) umbilicato; fructus pedicellus ca. 1 cm longus, corpo ca. 0.6 cm longo; semina ignota.

Type Collection: M. Farinas, J. Velasquez, & E. Medina 435 (holotype US 2559561; isotype VEN), collected on the lower (southeast?) slopes of Cerro Duida, Terr. Amazonas, Venezuela elev. 1000 m, Jan.-Feb. 1969. "Arbustico de flores rosadas".

The suggested relative has the same hypanthial and calyx features, but 5-nerved leaves persistently stout-strigose above. The other erect species with 3-celled ovaries, A. barbata Triana, A. fruticosa Wurdack, and A. saxosa Wurdack, all have much broader 5-nerved leaves and less distinct fruiting pedicels. Three other species of Adelobotrys with narrow leaves, A. subsessilis Gleason, A. rachidotricha Brade, and A. linearifolia Uribe, have been described; all differ from A. stenophylla in the malpighian foliar indument, auriculate or cordulate leaf bases, and 5-celled ovaries. The floral dimensions given for A. stenophylla are from fairly mature buds, no open flowers being available. The new Adelobotrys is another example of the stenophyllous so striking in the Duida melastomes, other examples being Macairea linearis Gleason, Graffenrieda lanceolata Gleason, and Clidemia linearis (Gleason) Wurdack; perhaps this feature is a reflection of riparian habitat, with the frequently surging and receding water as the evolutionary factor.

TOCOCA ROTUNDIFOLIA (Triana) Wurdack, comb. nov.

Microphysca rotundifolia Triana, Trans. Linn. Soc. Bot. 28: 141. 1871.

This upper Rio Negro species was left dangling generically by Macbride after the generotype (M. quadrialata Naud.) was transferred to Tococa. While distinctive specifically, T. rotundifolia in vegetative and floral characters is readily accommodated in Tococa, where its closest floral relatives are perhaps several Venezuelan tepuál species which are generally without formicaria (T. obovata Gleason, T. bolivarensis Gleason) but with non-expanded stigmas. The few-flowered cymes of T. rotundifolia are morphologically terminal but almost immediately pseudolateral from rapidly overtopping branchlet growth.

CLIDEMIA OCTONA (Bonpl.) L. Wms. subsp. GUAYANENSIS Wurdack, subsp. nov.

Ramulorum pili erecti laeves 1-2(-3) mm longi sparsiusculi.

Type Collection: J. A. Steyermark 87068 (holotype US 2338565; isotype VEN), collected in forest 3-4 km SE of "Los Patos", N of Río Hacha and N of Río Supamo, 30 km S of El Manteco, Edo. Bolívar, Venezuela, elev. 360-380 m, 9 Aug. 1960. "Shrub 2 m; leaves membranous, rich green above, pale green

below; petals white; calyx pale green."

Paratypes: British Guiana: "60 miles Potaro Road," D. B. Fanshawe F3510 (For. Dept. Br. Gu. 7106) (NY); Wabuwak Mt., Kanuku Mts., Wilson-Browne WBL72 (For. Dept. Br. Gu. 5665) (NY); Hariwa Quarry 32 miles south of Mackenzie, Cowan 39276 (NY, US). Suriname: Jacob kondre, Saramacca River, Maguire 23755 (NY, US).

The Wilson-Browne collection was distributed as C. strigillosa (Sw.) DC., the Fanshawe specimen as Leandra sp., and the Maguire number as C. tiliaefolia DC. The collections are predominantly 7-merous in calyx, petals, and stamens, but two ovaries dissected (from the Fanshawe and Steyermark collections) were 10-celled. Typical C. octona has smooth eglandular hairs 5-10 mm long overtopping the sparse and short gland-tipped ones; the closest geographic approaches of subsp. octona to subsp. guayanensis are in northern Venezuela (Aragua) and northern Brazil (Serra dos Surucucus, Terr. Roraima). No authentic material has been seen of Cogniaux' Brazilian variety of Heterotrichum octonum (suggested by Louis Williams to really be C. hirta); recent Goias and Mato Grosso collections of the species do not deviate from the typical subspecies. One other anomalous variant of C. octona has been collected in Peru (Belshaw 3566 from San Antonio, Lamas, San Martín), with shorter than typical (ca. 4 mm long) cauline hairs, slightly asymmetric leaf bases, and constantly 6-merous flowers; the collection resembles a blending of C. octona and C. dentata D. Don, but will not be further categorized now.

After much independent fumbling, I agree with Naudin (Ann. Sci. Nat. ser. 3, 17: 306-307. 1852) and Louis Williams (Fieldiana Bot. 29: 558-559. 1963) that the toral scales in C. octona indicate placement near C. hirta (L.) D. Don, such scales not being seen in any other species presently placed in Heterotrichum. The flowers in typical C. octona are predominantly 7-8-merous, with isomerous or occasionally anisomerous (8-10-celled) ovaries; thus the 10-celled ovaries of subsp. guayanensis are not distinctive within the species. [Incidentally, as a gratuitous byproduct of type photograph examination, C. reflexa Gleason, and not C. spectabilis Gleason nor Maieta setosissima Suessenguth, seems to be a synonym of C. globulifera (Cogn.) L. Wms. If this be verified from type specimens, the correct name for the long-setose myrmecophilous species from Costa Rica again becomes C. spectabilis.]

CLIDEMIA STELLIPILIS (Gleason) Wurdack, comb. nov.

Leandra stellipilis Gleason, Fieldiana Bot. 28: 434. 1952.

Buds on the holotype and flowers on a more recent collection (Steyermark, Dunsterville, & Dunsterville 92755 from Cerro Venamo, Bolívar, Venezuela) show narrowly oblong apically rounded petals. The stellulate pubescence is lacking in the originally suggested relatives in Leandra. The 5-merous flowers with long external calyx teeth indicate placement within Clidemia in Sect. Staphidium.

CLIDEMIA BUNTINGII Wurdack, sp. nov.

C. involucratae DC. et C. morichensi Wurdack affinis, calycis dentibus exterioribus non eminentibus toro modice glanduloso-setuloso differt.

Frutex scandens; ramuli teretes densiuscule setulosi, pilis laevibus gracilibus erectis vel paulo reflexis ca. 1 mm longis. Petioli 0.5-1.5 cm longi; lamina 2.5-4.5(-5.5) X 1.5-2.5 cm ovata vel oblongo-ovata apice anguste acuto basi plerumque paulo (ca. 2 mm) cordata, supra modice strigulosa pilis gracilibus laevibus ca. 1 mm longis appressis vel erecto-incurvis, subtus in venis venulisque modice vel sparse appresso-setulosa, 5-nervata, venulis subtus subplanis modice irregulariterque reticulatis areolis ca. 0.5 mm latis. Inflorescentiae e foliorum superiorum axillis singulae plerumque triflorae raro 5-florae vel uniflorae, pedunculo gracili 1-3.5 cm longo sicut bracteis bracteolisque densiuscule setuloso pilis glanduliferis 0.7-1.2 mm longis sparse intermixtis; flores 5-meri subsessiles (pedicellis ca. 0.3 mm longis indistinctis), bracteolis 4.5-5 X 1-1.5 mm oblanceatis persistentibus. Hypanthium (ad torum) 4 mm longum densiuscule pilis gracilibus subappressis 1-1.5 mm longis eglandulosis armatum; calycis tubus 0.2 mm altus, lobis interioribus 1 mm longis ovato-oblongis ciliatis, dentibus exterioribus setuliferis inframarginalibus non eminentibus; torus modice pilis glanduliferis 0.1-0.2 mm longis ornatus. Petala 3.1-3.4 X 1.7 mm obovato-oblonga interdum setula glandulifera subapicali ornata alioqui glabra. Stamina isomorphica glabra; filamenta 2.2 mm longa; antherarum thecae 3 X 0.5-0.6 mm paulo subulatae, poro terminali 0.2 mm diam., connectivo nec prolongato nec appendiculato. Stigma non vel paullulo expansum 0.3 mm diam.; stylus 8 X 0.25 mm glaber; ovarium 3-loculare 3/4 inferum, collo ca. 0.6 mm alto modice glanduloso-setuloso.

Type Collection: G. S. Bunting 2874 (holotype US 2547533; isotype Herb. Maracay), collected in moist forest near the military camp, Km 131-134 of the El Dorado-Gran Sabana highway, Edo. Bolívar, Venezuela, elev. ca. 1200 m, 16 Feb. 1968. "Climber on tree trunks to 4 m or more; branches pendent. Flower heads light violet; stamens white."

Paratypes (all from vicinity of Km 125, road south of El Dorado, Edo. Bolívar, elev. 1000-1200 m): Steyermark & Nilsson 43 and 179, Steyermark & Aristeguieta 85, all in young bud or fruiting.

Both suggested relatives are terrestrial shrubs with the external calyx teeth projecting beyond the internal lobes, a glabrous torus, and ovaries only 1/4-1/3 inferior. Clidemia involucrata also has leaves in each pair rather dimorphic in size and usually broadly acute to obtuse at the base, as well as shorter peduncles and hypanthia; C. morichensi has thicker glandular-ciliate leaf blades. The habit of C. buntingii is somewhat suggestive of the species-group around C. blepharodes DC.; all these southeast Brazilian species have long-projecting external calyx teeth, a glabrous torus, and ovaries about 1/3 inferior. There is no close affinity of C. buntingii with the

climbing or creeping species, C. epibaterium DC. or (ex char.) C. repens Triana.

CLIDEMIA BERNARDII Wurdack, sp. nov.

C. piperifoliae Gleason affinis, foliis tenuioribus subtus in venis secundariis tertiariisque sparse pilis 0.1-0.3 mm longis setulosis calycis dentibus exterioribus brevioribus differt.

Ramuli teretes sicut foliorum costae subtus petiolique modice pilis 0.5-0.7(-1) mm longis incurvo-appressis laevibus basim versus robustiusculis induti; petioli 1.5-3 cm longi; lamina 12-21 X 5-8.5 cm elliptica utroque acuta basi interdum paulo asymmetrica, membranacea et obscure ciliolato-serrulata, supra primum bullata bullis unisquisque setula robusta 0.1-0.3 mm longa terminatis et in venis primariis modice gracili-strigulosa demum plana et glabrata, subtus in venis primariis sparsiuscule appresso-setulosa pilis robustiusculis 0.3-0.5 mm longis in venis secundariis tertiariisque sparse setulosa pilis 0.1-0.2 mm longis in venulis superficieque glabra, subalternatim 5(-7)-plinervata pari interiore 2-4 cm supra laminae basim divergente venis secundariis 3-5 mm inter se distantibus venulis subtus planis densiuscule reticulatis areolis 0.2-0.3 mm latis. Flores 4-meri sessiles in foliorum superiorum axillis pauciglomerati (alabastris submaturis solum cognitis), bracteolis persistentibus ca. 1 mm longis late ovatis vel oblatis. Hypanthium (ad torum) ca. 1.5 mm longum modice strigulosum, pilis laevibus 0.5-0.7 mm longis; calycis tubus 0.2 mm longus, lobis interioribus ovatis rotundatis 0.4 mm longis, dentibus exterioribus crassis setuliferis 0.2-0.3 mm eminentibus. Petala extus mucrone subapicali brevi ornata alioqui glabra, apice rotundato. Stamina isomorphica glabra; antherarum thecae ca. 1-1.1 X 0.2 X 0.3 mm anguste oblongae, poro minuto 0.1 mm diam.; connectivum nec prolongatum nec appendiculatum. Stigma in alabastris paullulo expansum; stylus glaber; ovarium 4-loculare 2/3 inferum, apice sparse setuloso pilis ca. 0.15 mm longis.

Type Collection: A. L. Bernardi 820 (holotype NY), collected in rainforest on the lower slopes of Aprada-tepui, Mun. Urimán, Edo. Bolívar, Venezuela, elev. 1000-1200 m, 19 Aug. 1953 (in bud).

Paratype: Bassett Maguire, J. A. Steyermark, & C. K. Maguire 60312 (NY, US), from Camp No. 2, Rio Tucano, Amazonas, Brazil, elev. 260 m, 2 Dec. 1965 (fruiting). "Shrub 2.5 m. Hypanthium green; fruit fleshy, gray-blue." (Third Serra da Neblina Expedition. Rio Negro, Rio Cauaburi).

Clidemia piperifolia has thicker leaf blades which are densely long-setulose (the fine hairs ca. 1 mm long) on the veins beneath, denser and longer cauline and hypanthial pubescence, external calyx teeth projecting 0.5-0.7 mm beyond the internal lobes, and ovarial setulae 0.4-0.5 mm long. Only one flower bud of C. bernardii was dissected; thus the difference in ovary-cell number from C. piperifolia may not be diagnostic. All the specific differences are quantitative, but the accumulation gives

C. bernardii a different aspect; the young leaves are bullate above, but mature ones (dried) have plane (or nearly so) surfaces. The other described species in this alliance, C. heteroneura (DC.) Cogn., has no simple hairs, merely a pulverulence on most parts, as well as subulate bracteoles. Two other taxa in this species-group remain undescribed; one is represented by Tate 818 (NY, US), from Cerro Duida, resembling C. piperifolia in the permanently bullate leaves and C. bernardii in the attenuated pubescence, but differing from both in the much smaller (5-7 X 1.5-2 cm) leaf blades; the other was sampled in Schultes 16908 (NY, US), from the Río Apaporis, Colombia, with foliar features intermediate between C. piperifolia and C. bernardii but finer cauline pubescence and glabrous (in young fruit) ovary apices. More material is required for both taxa before descriptions can be written.

CLIDEMIA TEPUIENSIS Wurdack, nom. nov.

Clidemia coriacea (Naud.) Cogn., Mart. Fl. Bras. 14(4):

510. 1888, non C. coriacea Naud., Ann. Sci. Nat. ser. 3 Bot. 17:

368. 1852.

Staphidiastrum coriaceum Naud., Ann. Sci. Nat. ser. 3 Bot.

17: 329. 1852.

Sagraea coriacea (Naud.) Triana, Trans. Linn. Soc. Bot. 28:

138. 1871.

CLIDEMIA LINEARIS (Gleason) Wurdack, comb. nov.

Leandra linearis Gleason, Bull. Torrey Club 58: 425. 1931.

Nowhere in either Clidemia or Miconia can I find the exact floral character combination exhibited by the two above-cited species and C. duidae Gleason. The bracteoles, hypanthium, and calyx are approximated in M. condylata Wurdack and M. ferreyrae Wurdack, but both these Peruvian species lack the glandular inflorescence hairs, the setulose torus (within), and the 3-celled ovaries found in the three tepui species of Clidemia. With no better clues at present as to the best generic disposition, the impending Flora de Venezuela treatment of the family has impelled the current choice of two rather than three new combinations. For an earlier allusion to the problem, see Mem. N. Y. Bot. Gard. 10(5): 185. 1964.

BARTER IN BOTANY
ARNOLD'S "POISONOUS PLANTS OF HAWAII"

Otto Degener

The late Dr. Fennel, Director of the laboratory of a famed Honolulu medical clinic, had as colleagues Dr. Harry L. Arnold, general practitioner, and the late Dr. Cloward, an eye, ear and nose specialist. The Fennels owned a cottage at Mokuleia Beach on the north shore of Oahu. Degener, with one "normal" assistant and one on parole to him from a nearby Territorial institution, lived on the neighboring lot. These three, to relax from botanical duties and to keep out of mischief, kept fish traps on the reef, swimming to clear them each morning and afternoon of their palatable catch.

Fennel noticed that diving twice a day to cover the traps with coral blocks to simulate a grotto attractive to fish and lobster, aggravated Degener's sinus trouble. An operation was indicated yet Degener tarried, worrying about the expense. Learning that Arnold was floundering about in search for botanical aid in writing and illustrating his manuscript about local poisonous plants, barter was arranged. For the desired help, Cloward would operate on Degener free of charge. In fact a few weeks later, after punching out the patient's offending tissues with mallet and chisel, he told him to open his mouth. After quick inspection, he informed the attending nurse "his tonsils are diseased" and, without more ado, excised them in a jiffy.

For this unusual medical bargain Degener furnished Arnold the desired drawings from the Flora Hawaiiensis and conscientiously checked the scientific names of Arnold's selected poisonous plants. Realizing that Grevillea had been published in 1810 and Stylurus in 1809, he recommended the use of the latter according to the rules of botanical nomenclature.

In the review of "Poisonous Plants of Hawaii" appearing June 1969, it states that the "botany has been checked by Dr. Otto Degener", but the general reader is not aware that this checking applies to edition one only. Had Degener been aware that a second edition was in the making, he would have explained to the author that Botany, like Medicine, is a growing Science and that binomials may be changed for various reasons. For instance, Degener abandoned the use in print of Stylurus in 1959 after Grevillea had been voted a nom. cons. Had Dr. Arnold kept in touch with his amamensis of 1944, the latter with or without the benefit of another operation, would have suggested the tipping in of a page of such Errata in the second edition of "Poisonous Plants of Hawaii" to enhance its value.

A NEW SPECIES OF LANTANA FROM VENEZUELA

Harold N. Moldenke

LANTANA ARISTEGUIETAE Moldenke, sp. nov.

Frutex; foliis ternatis ovatis interdum subrotundatis magnis acutis grosse serratis ad basin longe acuminatis, utrinque breviter pilosis, subtus dense resinoso-punctatis; inflorescentiis axillaribus ternatis; pedunculis gracillimis dense breviterque pubescentibus; capitulis hemisphaericis multifloris valde bracteatis.

Shrub, about 1 m. tall, stoloniferous; branches slender, striate, densely short-pubescent, less so in age; nodes annulate; principal upper internodes 2--4 cm. long; leaves ternate, large; petioles 1--3 cm. long, canaliculate above, densely short-pubescent with whitish retrorse hairs, winged toward the apex; blades thinly membranous, dark-green above, lighter beneath, ovate or sometimes almost subrotund, 13--17 cm. long, 5--12 cm. wide, mostly acute at the apex, very coarsely serrate along the margins except on the basal acumination with broad rounded teeth, long-acuminate into the petiole at the base, rather uniformly short-pilose above, more densely so and resinous-punctate beneath; inflorescence axillary, in the uppermost axils, ternate; peduncles very slender, about 6 cm. long, densely short-pubescent; heads hemispheric, many-flowered, 1.5--2.3 cm. wide, very conspicuously bracteose; bracts large, foliaceous, ovate, the outermost ones almost 1 cm. long and 4 mm. wide, acute at the apex, densely pilose on both surfaces; corolla rose-color; fruit small, shiny, hidden by the bracts (but perhaps still immature).

The type of this species was collected by Leandro Aristeguieta (in whose honor it is named) and R. Labbiente (no. 7306) in the woods near Playa Colorado, about 25 km. from Puerto La Cruz on the road to Cumaná, Anzoategui, Venezuela, in September, 1969, and is deposited in my personal herbarium at Plainfield, New Jersey. The collectors note that the plant is "Abundante en el autobosque, donde forma colonias densas". They report the corolla color, but I have not personally seen the flowers. The leaves of the type specimen have much the general aspect of those of Callicarpa americana L.

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BOOK REVIEWS

Alma L. Moldenke

"SPRING FLORA OF MINNESOTA, INCLUDING COMMON CULTIVATED PLANTS"
by Thomas Morley, 283 pp., illus., 2nd edition with revision.
University of Minnesota Press. 1969. \$7.75.

Three years ago the first edition of this work appeared in soft cover. The care with which this has been prepared indicates that it must have grown from mimeographed form used in the spring-time courses in spring flora identification and from the excellent herbarium on the campus. Now it is available not only to the student, but also to the amateur and professional botanist. This good work should be followed by volume(s) on the summer and autumn flora, perhaps omitting repetitions of family and generic descriptions. The keys are workable, covering 662 species of native plants and 194 cultivated ones from among the angiosperms and gymnosperms.

The only illustrations are for vegetational and county maps and plant parts, none for the plants themselves.

There is a helpful glossary, species distribution records, a county index, nomenclature mostly à la Fernald, and a good general index.

"INSECT PESTS OF FARM, GARDEN AND ORCHARD" by Ralph Howard Davidson & Leonard Marion Peairs, ix & 675 pp., illus., 6th edition. John Wiley & Sons, Inc., New York, N. Y., London, & Sydney. 1966. \$17.50.

Ever since the 1912 edition by Sanderson this text has been a dependable stand-by for college courses in economic and agricultural entomology, for libraries, for research and extension entomologists, for county agricultural agents, for home and professional gardeners, for farmers and for pest control operators. Each new edition has been considerably modernized to include the latest in pests and the latest in control materials and techniques.

The contents include information on the importance of insects to man, insect structures and metamorphoses, classical taxonomic arrangements, natural, mechanical, chemical, cultural, biological and legislative insect control, insecticide formulations and applications, illustrated diagnostic notes and controls of insects injurious to various vegetables, fruits, ornaments, shade trees, flowers, household and stored products, man and domestic animals. It also considers other invertebrate pests such as mites, slugs and nematodes.

Since man's crops have been spread to many places in this world and since their pests have accompanied or followed them, this book is also of value in many temperate areas beyond the borders of the United States.

For bibliographic referral general references are listed at the end of the introductory chapter and many specific ones are listed at the end of pertinent topics. There is a useful index.

The illustrations are copious and clear black-and-white photographs and accurate line drawings; they are much more effective for diagnostic and educational purposes than some of the blurred inexpensive colored ones current in related literature.

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STUDIES IN THE EUPATORIEAE (COMPOSITAE). XVIII.

NEW COMBINATIONS IN FLEISCHMANNIA

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In this article we are setting forth a new and natural concept for the old and much misused generic name, Fleischmannia. This is part of a revisionary effort that began in our study of the Hofmeisteria complex (King & Robinson, 1966). The initial stage of the revision of Fleischmannia, the removal of alien species, has continued to the point where only one species, F. arguta, remains in the genus. A second stage, represented in this paper, is the recharacterization of Fleischmannia and the inclusion of all species that we recognize as related to F. arguta.

The previous unnatural concepts of Fleischmannia have all emphasized the five setae of the pappus, a character not found in any other species we presently recognize in the genus. The relationships given here are not entirely new concepts, however. In the original description of Eupatorium trinervium Schultz-Bip. (Seemann, 1856) there was the comment "Obs. Eupatorio arguto H.B.K. . . . affinis esse videtur". A more critical understanding is shown in the remarks of B.L. Robinson (1926) in his description of Eupatorium rivulorum. "This species in habit, habitat, foliage, and in some details of pubescence recalls Fleischmannia arguta (H.B.K.) Robinson, . . . The species, if referred to Fleischmannia would by its indefinite (though not very numerous) pappus-bristles, break down the slight distinction between that genus and Eupatorium. If, on the other hand it is referred to Eupatorium (from which on technical grounds it cannot be readily separated) its close similarity to Fleischmannia must render the further separation of that genus rather artificial. Neither disposition is entirely satisfactory".

As characterized here, the genus Fleischmannia is a natural entity clearly distinct from all other genera in the Eupatorieae. Closest relationship may be to the small genus Conoclinium of the United States and northern Mexico, but that genus shows numerous glands on the corolla and achene, a rather indistinct carpodium, and blunt-tipped cells at the apices of the pappus setae. There has been considerable confusion between species of Fleischmannia and the superficially similar species variously treated as Kyrstenia or Ageratina, but as will be shown in the treatment of the latter group, no really close relationship is involved.

Chromosome counts of species occur in many publications, but the most significant study is that of Baker (1967).

Fleischmannia Schultz-Bip., Flora 33: 417. 1850.

Sparingly branched herbs; leaves opposite, rarely subopposite or alternate, elliptical to rhomboidal usually with cuneate short-petiolate base, upper margin serrate or crenulate, in one species leaves dissected into long narrow segments. Inflorescence laxly branching; heads 30-50 flowered; involucre of ca. 30 narrow, usually acute, subimbricate, mostly subequal phyllaries in 2-3 series; receptacle glabrous or with minute scattered hairs. Corolla tubular with only slightly narrowed base; outer surface of lobes usually with short hairs, with glands in some Mexican and central American species, surface papillose with projecting cells ends especially along margins of lobes, stomates absent; cells of much of inner surface of lobes and tube with upper ends projecting as papillae, cells of tube mostly narrow with sinuous walls. Anther collar usually slender, with elongate cells showing distinct transverse thickenings throughout, with few or indistinct short cells below; exothecial cells mostly quadrate or wider than long; anther appendage large, often truncate at apex. Style without distinct basal node; surface cells of stylar appendage densely long projecting. Achene prismatic, usually with setae or serrations on ribs, without glands; carpodium distinct with prominent upper rim, rounded with thick walled usually quadrate cells; pappus of 5-40 slender sometimes fragile setae, with pointed apical cells. Embryo not noticeably sclerotized at lower end. Chromosome numbers $n = 4$, $n = 10$.

Type species: Fleischmannia rhodostylis Schultz-Bip. = F. arguta (H.B.K.) B.L.Robinson.

Our studies indicate that the genus contains the following fifty three species.

Fleischmannia aequinoctialis (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium aequinoctiale B.L.Robinson, Contr. Gray Herb. n.s. 61: 4. 1920. Ecuador.

Fleischmannia anisopoda (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium anisopodum B.L.Robinson, Proc. Amer. Acad. 36: 477. 1901. Guatemala.

Fleischmannia arguta (H.B.K.) B.L.Robinson, Proc. Amer. Acad. 42: 35. 1906. Eupatorium argutum H.B.K., Nov. Gen. et Sp. 4: 121. ed. fol. 1818. Mexico.

Fleischmannia bergantinensis (Badillo) R.M.King & H.Robinson, comb. nov. Eupatorium bergantinense Badillo, Bot. Soc. Venez. Cienc. Nat. 10: 294. 1946. Venezuela.

Fleischmannia blakei (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium blakei B.L.Robinson, Contr. Gray Herb. n.s. 61: 5. 1920. Honduras.

Fleischmannia bridgesii (B.L.Robinson) R.M.King & H.Robinson,
comb. nov. Eupatorium bridgesii B.L.Robinson, Proc. Amer.
Acad. 55: 7. 1919. Bolivia.

Fleischmannia carletonii (B.L.Robinson) R.M.King & H.Robinson,
comb. nov. Eupatorium carletonii B.L.Robinson, Contr. Gray
Herb. n.s. 73: 7. 1924. Honduras.

Fleischmannia cookii (B.L.Robinson) R.M.King & H.Robinson, comb.
nov. Eupatorium cookii B.L.Robinson, Proc. Amer. Acad. 55:
9. 1919. Peru.

Fleischmannia crocodilia (Standley & Steyermark) R.M.King &
H.Robinson, comb. nov. Eupatorium crocodilium Standley &
Steyermark, Field Mus. Publ., Bot. 23: 182. 1944. Guatemala.

Fleischmannia dissolvens (Baker) R.M.King & H.Robinson, comb. nov.
Eupatorium dissolvens Baker in Martius, Flora Brasil. 6(2):
308. 1876. Brasil.

Fleischmannia fragilis (B.L.Robinson) R.M.King & H.Robinson,
comb. nov. Eupatorium fragile B.L.Robinson, Contr. Gray
Herb. n.s. 100: 13. 1932. Peru.

Fleischmannia gonzalezii (B.L.Robinson) R.M.King & H.Robinson,
comb. nov. Eupatorium gonzalezii B.L.Robinson, Proc. Amer.
Acad. 36: 479. 1901. Mexico.

Fleischmannia holwayana (B.L.Robinson) R.M.King & H.Robinson,
comb. nov. Eupatorium holwayanum B.L.Robinson, Proc. Amer.
Acad. 42: 40. 1906. Mexico.

Fleischmannia huigrensis (B.L.Robinson) R.M.King & H.Robinson,
comb. nov. Eupatorium huigrense B.L.Robinson, Contr. Gray
Herb. n.s. 61: 7. 1920. Ecuador.

Fleischmannia hymenophylla (Klatt) R.M.King & H.Robinson, comb.
nov. Eupatorium hymenophyllum Klatt in Durand & Pittier,
Bull. Soc. Bot. Belg. 31: 190. 1892 (1893). Costa Rica.

Fleischmannia imitans (B.L.Robinson) R.M.King & H.Robinson,
comb. nov. Eupatorium imitans B.L.Robinson, Contr. Gray
Herb. n.s. 68: 20. 1923. El Salvador.

Fleischmannia incarnata (Walter) R.M.King & H.Robinson, comb.
nov. Eupatorium incarnatum Walter, Flora Carolin. 200.
1788. United States, Mexico.

Fleischmannia jejuna (Standley & Steyermark) R.M.King &
H.Robinson, comb. nov. Eupatorium jejunum Standley &

Steiermark, Field Mus. Publ., Bot. 23: 183. 1944. Guatemala.

Fleischmannia klattiana (Hieron.) R.M.King & H.Robinson, comb. nov. Eupatorium klattianum Hieron., Engl. Bot. Jahrb. 28: 573. 1901. Colombia.

Fleischmannia laxicephala (Cabrera) R.M.King & H.Robinson, comb. nov. Eupatorium laxicephalum Cabrera, Sellowia 15: 196. 1963. Brasil.

Fleischmannia laxa (Gardner) R.M.King & H.Robinson, comb. nov. Eupatorium laxum Gardner, Hook. Lond. Journ. Bot. 5: 476. 1846. Brasil.

Fleischmannia lithophila (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium lithophilum B.L.Robinson, Contr. Gray Herb. n.s. 73: 14. 1924. Peru.

Fleischmannia lloensis (Hieron.) R.M.King & H.Robinson, comb. nov. Eupatorium lloense Hieron. in Sodiro, Engl. Bot. Jahrb. 29: 11. 1901. Ecuador.

Fleischmannia magdalenensis (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium magdalenensis B.L.Robinson, Proc. Amer. Acad. 54: 250. 1918. Colombia.

Fleischmannia marginata (Poepp. & Endl.) R.M.King & H.Robinson, comb. nov. Eupatorium marginatum Poepp. & Endl., Nov. Gen. ac Sp. Plant. 3: 54. 1845. Peru.

Fleischmannia mayorii (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium mayorii B.L.Robinson, Contr. Gray Herb. n.s. 68: 24. 1923. Colombia.

Fleischmannia mercedensis (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium mercedense B.L.Robinson, Contr. Gray Herb. n.s. 104: 19. 1934. Peru.

Fleischmannia microstemon (Cassini) R.M.King & H.Robinson, comb. nov. Eupatorium microstemon Cassini, Dict. Sci. Nat. 25: 432. 1822. Mexico, C.Amer., W.Ind., S.Amer.

Fleischmannia misera (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium miserum B.L.Robinson, Proc. Amer. Acad. 54: 258. 1918. Colombia.

Fleischmannia multinervis (Benth.) R.M.King & H.Robinson, comb. nov. Eupatorium multinerve Benth., Plant. Hartweg. 76. 1841. C.Amer.

Fleischmannia obscurifolia (Hieron.) R.M.King & H.Robinson, comb. nov. Eupatorium obscurifolium Hieron. in Sodiro, Engl. Bot. Jahrb. 29: 9. 1900. Ecuador.

Fleischmannia pennellii (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium pennellii B.L.Robinson, Proc. Amer. Acad. 54: 254. 1918. Colombia.

Fleischmannia plectranthifolia (Benth. ex Oerst.) R.M.King & H.Robinson, comb. nov. Eupatorium plectranthifolium Benth. ex Oerst., Kjoeb. Vidensk. Meddel. 76. 1852. Costa Rica.

Fleischmannia polopolensis (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium polopolense B.L.Robinson, Contr. Gray Herb. n.s. 61: 10. 1920. Bolivia.

Fleischmannia porphyranthema (A.Gray) R.M.King & H.Robinson, comb. nov. Eupatorium porphyranthemum A.Gray, Proc. Amer. Acad. 15: 27. 1880. Mexico.

Fleischmannia prasiifolia (Griseb.) R.M.King & H.Robinson, comb. nov. Eupatorium prasiifolium Griseb., Abh. Kön. Ges. Wiss. Gött. 19: 167. 1874. Argentina, Paraguay, Brasil.

Fleischmannia pratensis (Klatt) R.M.King & H.Robinson, comb. nov. Eupatorium pratense Klatt, Bull. Soc. Bot. Belg. 31: 193. 1892 (1893). Costa Rica.

Fleischmannia pycnocephaloides (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium pycnocephaloides B.L.Robinson, Proc. Amer. Acad. 51: 534. 1916. Guatemala.

Fleischmannia pycnocephala (Lessing) R.M.King & H.Robinson, comb. nov. Eupatorium pycnocephalum Lessing, Linnaea 6: 404. 1831. N.Amer.-S.Amer.

Fleischmannia remotifolia (A.P.Decandolle) R.M.King & H.Robinson, comb. nov. Eupatorium remotifolium A.P.Decandolle, Prodr. 5: 165. 1836. Brasil.

Fleischmannia rhodotephra (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium rhodotephrum B.L.Robinson, Contr. Gray Herb. n.s. 77: 32. 1926. Peru.

Fleischmannia rivulora (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium rivulorum B.L.Robinson, Contr. Gray Herb. n.s. 77: 34. 1926. Mexico.

Fleischmannia schickendantzii (Hieron.) R.M.King & H.Robinson, comb. nov. Eupatorium schickendantzii Hieron., Engl. Bot. Jahrb. 22: 769. 1897. Argentina.

- Fleischmannia seleriana (B.L.Robinson) R.M.King & H.Robinson,
comb. nov. Eupatorium selerianum B.L.Robinson, Proc. Amer.
Acad. 35: 340. 1900. Mexico.
- Fleischmannia sideritides (Benth. ex Oerst.) R.M.King & H.Robinson,
comb. nov. Eupatorium sideritides Benth. ex Oerst.,
Kjoeb. Vidensk. Meddell. 77. 1852. Costa Rica.
- Fleischmannia sinaloensis (B.L.Robinson) R.M.King & H.Robinson,
comb. nov. Eupatorium sinaloense B.L.Robinson, Contr. Gray
Herb. n.s. 77: 39. 1926. Mexico.
- Fleischmannia sinclairii (Benth. ex Oerst.) R.M.King & H.Robinson,
comb. nov. Eupatorium sinclairii Benth. ex Oerst., Kjoeb.
Vidensk. Meddel. 79. 1852. C.Amer.
- Fleischmannia soratae (Schultz-Bip. ex B.L.Robinson) R.M.King &
H.Robinson, comb. nov. Eupatorium soratae Schultz-Bip. ex
B.L.Robinson, Contr. Gray Herb. n.s. 61: 51. 1920. Bolivia.
- Fleischmannia tamboensis (Hieron.) R.M.King & H.Robinson, comb.
nov. Eupatorium tamboense Hieron., Engl. Bot. Jahrb. 22:
770. 1897. Bolivia.
- Fleischmannia trinervia (Schultz-Bip.) R.M.King & H.Robinson,
comb. nov. Eupatorium trinervium Schultz-Bip. in Seemann,
Bot. Voy. Herald 300. 1856. Mexico.
- Fleischmannia valeriana (Standley) R.M.King & H.Robinson, comb.
nov. Eupatorium valerianum Standley, Field Mus. Publ., Bot.
18: 1474. 1938. Costa Rica.
- Fleischmannia viscidipes (B.L.Robinson) R.M.King & H.Robinson,
comb. nov. Eupatorium viscidipes B.L.Robinson, Proc. Amer.
Acad. 36: 484. 1901. C.Amer.
- Fleischmannia yungasensis (B.L.Robinson) R.M.King & H.Robinson,
comb. nov. Eupatorium yungasense B.L.Robinson, Contr. Gray
Herb. n.s. 104: 30. 1934. Bolivia.

Excluded species

- Fleischmannia repens B.L.Robinson = Ageratina.
F. schaffneri A.Gray = Hofmeisteria.
F. standleyi Blake = Hofmeisteria.
F. urenifolia (Hook. & Arn.) Benth. & Hook.f. = Hofmeisteria.

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STUDIES IN THE EUPATORIEAE (COMPOSITAE). XIX.

NEW COMBINATIONS IN AGERATINA

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In the present treatment of the genus Ageratina it is gratifying to us to be able to supply the evidence that confirms the suspicions of so many other workers, and which brings some order out of the previous chaos in Eupatorium. With varying degrees of insight, Moench, Necker, Spach, Schultz-Bipontinus, Coulter, and E.L.Greene have noted the more distinctive members of Ageratina and have sought to place them in a separate genus. With equal determination, other workers have found that other species obscure the generic limits, and the concept of a monolithic genus Eupatorium has been restored. More recently cytologists have discovered widely differing series of chromosome numbers in Eupatorium but could find no basis for separation of the species involved. All indications have been that a distinct element existed if reliable characters could be found. Now, by use of detailed floral anatomy, we have been able not only to precisely delimit Ageratina, but to recognize a whole complex of genera as Ageratinoid.

The initial efforts to recognize a distinct genus must have relied on mostly superficial aspect of very limited material. Even so, the efforts of Moench and Necker were both doomed to failure. Moench used the name, Batschia, which was third in a series of four homonyms. Necker did not indicate the status of any of his names and his Kyrstenia is not considered validated until the work of E.L.Greene (1903). Spach (1841) dealing with the two common species of eastern North America (under three names) provided the earliest valid name for the genus, Ageratina.

Of all the previous efforts, that of E.L.Greene deserves special attention. Aside from misplaced faith in the Necker name, Kyrstenia, Greene seemed to have a rather good concept of the group. Among other remarks indicating his resolve to dismantle Eupatorium, he offered the following, "These two plants (i.e. E. ageratoides and E. aromaticum), and with them a host of their congeners are so unlike true Eupatorium and at the same time so like Ageratum in foliage, inflorescence, uniserial involucre, and even as to flowers and fruits, that nothing but the fine-bristly rather than paleaceous pappus could have kept them apart from the genus last named, where, as already noted, Linnaeus did actually place the first species. They differ from Eupatorium by a set of characters exactly corresponding to those by which Erigeron is held separate from Aster."

"One must needs assume the Atlantic North American species

just mentioned to be the proper type of Kyrstenia. They are herbaceous perennials with opposite leaves and a corymbose inflorescence; their thin almost uniserial involucre bracts notably pointed."

Greene goes on to say, "This typical group has many representatives beyond our borders in Mexico, Central and even South America, some herbaceous, others shrubby, of which I cite but few."

It must be made clear that there is not now any evidence of close relationship between Ageratina and Ageratum. The latter has high papillae on the backs of the corolla lobes, strong annulations in the anther collars, and a very different carpodium structure in addition to the pappus character. Also, Greene's concept of Eupatorium was slightly erroneous, since the verticillate group he emphasized is not typical but a rather specialized subgenus. Still, Eupatorium clearly differs from Ageratina by its smooth corolla lobes, hairy styler base, indistinct carpodium, presence of only glands on the corolla and achene, and blunt-tipped pappus setae.

Among the species cited by Greene there are members of a group that includes Eupatorium pycnocephalum Lessing. This group is the one most frequently confused with Ageratina, and with its basic chromosome number of $x = 10$ it has been especially frustrating to the efforts of cytologists. These species which are so superficially similar, we would place in the totally separate genus, Fleischmannia, and we do not consider them at all closely related. Fleischmannia while similar in habit, leaf form, and tendency for hairy corollas, is clearly distinct in the papillose backs of the corolla lobes, the strongly annulated thickenings of the anther collars, the complete lack of enlargement of the style base, and the thick-walled cells of the strongly rimmed carpodium. Even the papillae of the inner surface of the corolla lobes are different in basic structure, being only the projecting upper ends of elongate cells and not forming a compact mass. Needless to say the more specialized features of Ageratina such as the narrow stemmed corollas and very deciduous pappus setae do not occur in Fleischmannia.

The genera that are most closely related to Ageratina are not necessarily those that have been confused with it. Often they have possessed distinctive characters and have been maintained separate from Eupatorium. It is to Ageratina rather than to Ageratum that Oxylobus is related in spite of its distinctive squamate pappus. The corollas, stamens, styles, and carpodia of Oxylobus, Macvaughiiella, and Jaliscoa are all basically identical to those of Ageratina. Macvaughiiella is distinguished by the flattened achene with 3 or less pappus setae at its angles, and Jaliscoa has its short crest-like pappus and a paleaceous receptacle. Less close but definitely related are such groups as Spaniopappus of the West Indies, and Eupatorium eximium and its relatives in Costa Rica.

Cytological evidence is strongly in agreement with that from floral anatomy. Reports as obtained from Darlington & Wylie (1956) and various suppliments (Cave, 1956-64; Ornduff, 1965-67; Powell & King, 1969) indicate the following: A. adenophora (as E. glandulosum, two separate counts) $2n = 51$; A. altissima (as E. ageratoides and E. rugosum) $2n = 34, 36$; A. anisochroma $n = ca. 17$; A. azangaroensis (as E. sp., Powell & King, 1969) $n = 17a$; A. glabrata $n = 17$; A. gracilis $n = 18?$; A. herbacea $n = 17$, $2n = 34$; A. occidentalis $2n = 34$; A. pazcuarensis $n = 25$; A. petiolaris $2n = 34$; A. prunellaefolia $n = 50I, 52I$; A. purpusii $2n = 34$; A. riparia $2n = 48$; A. rockrothii $2n = 51$, over 80; A. scorodonioides $n = 17$; A. sternbergiana $2n = 34$; A. tinifolia $n = ca. 40$; A. ventillana $n = 17$; A. wrightii $2n = 34$. One specimen reported as $n = 10$, King 3037, Mexico, cf. E. ligustri-num DC. (Turner, Ellison, & King, 1961), has been checked and proves to be Eupatorium albicaule Schultz-Bip. which is not an Ageratina. There seems little doubt that the base number of Ageratina is $x = 17$. Ageratina adenophora with type II pollen in some plants (King & Robinson, 1967) seems to be an apomictically reproducing triploid.

At present, there is only one report of $n = 17$ outside of Ageratina, in a Costa Rican plant possibly related to Eupatorium eximium B.L.Robinson. The closely related genus, Oxylobus, has been consistently reported as $n = 16$.

It is worth noting that this cytological evidence has been compiled by us since having established the limits of Ageratina on the basis of floral anatomy. We here provide others with an opportunity to compare what cytological evidence they may have on other species with the list that follows.

Ageratina Spach, Hist. Veg. Phan. 10: 286. 1841

Batschia Moench, Meth. 567. 1794. not Batschia Gmelin, 1791 (Boraginaceae); Batschia Mutis ex Thunberg, 1792 (Menispermaceae); or Batschia Vahl, 1794 (Leguminosae). T.: B. nivea Moench = Ageratina altissima (L.) R.M.King & H.Robinson.

Ageratiopsis Schultz-Bip. ex Benthham & J.D.Hooker, Gen. Pl. 2: 246. 1873. nom. nud. T.: Eupatorium ageratoides Linnaeus f. = Ageratina altissima (L.) R.M.King & H.Robinson.

Mallinoa Coulter, Bot. Gaz. 20: 47. 1895. T.: M. corymbosa Coulter = Ageratina muelleri (Schultz-Bip. ex Klatt) R.M.King & H.Robinson.

Kyrstenia Necker ex E.L.Greene, Leaf1. Bot. Obs. Crit. 1: 8. 1903. L.T.: Eupatorium aromaticum L. = Ageratina aromatica (L.) R.M.King & H.Robinson.

Sparingly to densely branched herbs or shrubs; leaves opposite, rarely only subopposite or alternate, deltoid to elliptical, short to long petiolate, margin toothed or lobed to entire, serrate in most species. Inflorescence laxly to rather densely corymbose; heads 10-40 flowered; involucre of ca. 30 rather narrow usually acute subimbricate mostly subequal phyllaries in 1-2(3) series; receptacle glabrous or with minute scattered hairs. Corolla tubular or often with a long very slender base and abruptly enlarged limb; outer surface and margins of lobes smooth often with some bulging or projecting cells at the tip, with hairs and/or glands or glabrous, without stomates; inner surface of lobes papillose with dense layer of short bulging or long-projecting cells; cells of backs of lobes and of tube mostly narrow with sinuous walls. Anther collar composed of numerous quadrate cells below, elongate cells above, all with little or no ornate thickening on the walls; exothecial cells in part usually lax and somewhat longer than wide; anther appendage large, often truncate at apex; pollen spherical, tricolpate, spinose, type II sometimes present. Style usually with distinctly swollen glabrous basal node which is often marked by special firm-walled cells; surface cells of stylar appendage densely long projecting, in two small groups of species with cells only slightly projecting. Achene prismatic, usually 5-costate, usually bearing setae or glands or both; carpopodium distinct but without distinct upper limit, cylindrical or rounded, with rather lax elongate or quadrate cells having thin beaded walls; embryo usually borne high in the achene with lower end partially sclerotized, basal vasculature of achene united to well above level of carpopodium; pappus of 5-40 slender scabrous setae often easily deciduous by specialized fragile zone at base, with pointed apical cells. Chromosome numbers $n = 17$, $n = 18?$, $2n = 34$, $2n = 36$, $n = \text{ca. } 40$, $2n = 48$, $2n = 51$, $2n = \text{over } 80$.

Lectotype species: Eupatorium aromaticum L. (King & Robinson, 1969).

Our studies indicate that the genus contains the following 4 subgenera and 196 species.

Subgenus Ageratina

Plants herbaceous; corollas usually very narrowly stalked below, usually with hairs on the backs of the lobes, rarely with a few long-stalked glands or glabrous; cells on inner surface of corolla lobes and on stylar appendage densely long-projecting; type II pollen seen in 1 species; achene without glands; carpopodium cylindrical with mostly elongate cells; pappus setae very easily deciduous. 80 species.

Ageratina adenophora (Spreng.) R.M.King & H.Robinson, comb. nov.
Eupatorium adenophorum Spreng., Systema Vegetabilium 3: 420.
1826. Mexico, California, W.Ind., S. Amer., Portugal, Pac.

Isl., Australia. Widely adventive.

Ageratina altissima (L.) R.M.King & H.Robinson, comb. nov.
Ageratum altissimum L., Sp. Pl. 839. 1753. E. United States.

Ageratina amblyolepis (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium amblyolepis B.L.Robinson, Proc. Amer. Acad. 35: 330. 1900. Mexico.

Ageratina apollinairei (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium apollinairei B.L.Robinson, Proc. Amer. Acad. 54: 236. 1918. Colombia.

Ageratina aromatica (L.) Spach, Hist. Veg. Phan. 10: 28. 1841.
Eupatorium aromaticum L., Sp. Pl. 839. 1753. E. United States.

Ageratina arsenei (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium arsenei B.L.Robinson, Contr. Gray Herb. n.s. 104: 10. 1934. Mexico.

Ageratina articulata (Schultz-Bip. ex Hieron.) R.M.King & H.Robinson, comb. nov. Eupatorium articulatum Schultz-Bip. ex Hieron. in Urban, Engl. Bot. Jahrb. 40: 385. 1908. Venezuela.

Ageratina aschenborniana (Schauer) R.M.King & H.Robinson, comb. nov. Eupatorium aschenbornianum Schauer, Linnaea 19: 720. 1847. Mexico.

Ageratina atrocordata (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium atrocordatum B.L.Robinson, Contr. Gray Herb. n.s. 104: 12. 1934. Mexico.

Ageratina azangaroensis (Schultz-Bip. ex Weddell) R.M.King & H.Robinson, comb. nov. Eupatorium azangaroense Schultz-Bip. ex Weddell, Chlor. Andina 1: 217. 1857. Ecuador.

Ageratina badia (Klatt) R.M.King & H.Robinson, comb. nov. Eupatorium badium Klatt, Bull. Soc. Bot. Belg. 31: 186. 1892 (1893). Costa Rica, Mexico.

Ageratina bellidifolia (Bentham) R.M.King & H.Robinson, comb. nov. Eupatorium bellidifolium Bentham, Pl. Hartw. 43. 1840. Mexico.

Ageratina bimatra (Standley & L.O.Williams) R.M.King & H.Robinson, comb. nov. Eupatorium bimatum Standley & L.O.Williams, Ceiba 3: 64. 1952. Honduras.

Ageratina bustamenta (A.P.Decandolle) R.M.King & H.Robinson, comb. nov. Eupatorium bustamenta A.P.Dceandolle, Prodr. 5: 168. 1836. Mexico.

Ageratina calderillensis (Hieron.) R.M.King & H.Robinson, comb. nov. Eupatorium calderillense Hieron. in Urban, Engl. Bot. Jahrb. 40: 381. 1908. Bolivia.

Ageratina camachensis (Hieron.) R.M.King & H.Robinson, comb. nov. Eupatorium camachense Hieron. in Urban, Engl. Bot. Jahrb. 40: 386. 1908. Bolivia.

Ageratina chiapensis (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium chiapense B.L.Robinson, Proc. Amer. Acad. 35: 332. 1900. Mexico.

Ageratina chiriquensis (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium chiriquense B.L.Robinson, Proc. Amer. Acad. 54: 238. 1918. Panama.

Ageratina choricephala (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium choricephalum B.L.Robinson, Proc. Amer. Acad. 54: 239. 1918. Mexico.

Ageratina choricephaloides (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium choricephaloides B.L.Robinson, Proc. Amer. Acad. 55: 8. 1919. Peru.

Ageratina ciliata (Lessing) R.M.King & H.Robinson, comb. nov. Eupatorium ciliatum Lessing, Linnaea 6: 404. 1831. Mexico.

Ageratina conspicua (Kunth & Bouché) R.M.King & H.Robinson, comb. nov. Eupatorium conspicuum Kunth & Bouché, Ind. Sem. Hort. Berol. 13. 1847. Mexico.

Ageratina corylifolia (Griseb.) R.M.King & H.Robinson, comb. nov. Eupatorium corylifolium Griseb., Fl. Brit. W. Ind. 361. 1861. W.Ind.

Ageratina cuencana (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium cuencanum B.L.Robinson, Proc. Amer. Acad. 54: 241. 1918. Ecuador.

Ageratina cutervensis (Hieron.) R.M.King & H.Robinson, comb. nov. Eupatorium cutervense Hieron. in Urban, Engl. Bot. Jahrb. 40: 383. 1908. Ecuador, Peru.

Ageratina dasyneura (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium dasyneurum B.L.Robinson, Proc. Amer. Acad.

55: 10. 1919. Colombia.

Ageratina enixa (B.L.Robinson) R.M.King & H.Robinson, comb. nov.
Eupatorium enixum B.L.Robinson, Contr. Gray Herb. n.s. 68:
15. 1923. Mexico.

Ageratina funkii (B.L.Robinson) R.M.King & H.Robinson, comb. nov.
Eupatorium funkii B.L.Robinson, Contr. Gray Herb. n.s. 68:
16. 1923. Colombia.

Ageratina gilbertii (B.L.Robinson) R.M.King & H.Robinson, comb.
nov. Eupatorium gilbertii B.L.Robinson, Proc. Amer. Acad.
55: 16. 1919. Peru.

Ageratina glabrata (H.B.K.) R.M.King & H.Robinson, comb. nov.
Eupatorium glabratum H.B.K., Nov. Gen. et Sp. 4: 121. ed.
fol. 1818. Mexico.

Ageratina glandulifera (Hieron.) R.M.King & H.Robinson, comb.
nov. Eupatorium glanduliferum Hieron. in Sodiro, Engl. Bot.
Jahrb. 29: 13. 1900. Ecuador.

Ageratina glechonophylla (Lessing) R.M.King & H.Robinson, comb.
nov. Eupatorium glechonophyllum Lessing, Linnaea 6: 105.
1831. Chile, Ecuador.

Ageratina gracilentia (B.L.Robinson) R.M.King & H.Robinson, comb.
nov. Eupatorium gracilentum B.L.Robinson, Proc. Amer. Acad.
55: 18. 1919. Peru.

Ageratina gracilis (H.B.K.) R.M.King & H.Robinson, comb. nov.
Eupatorium gracile H.B.K., Nov. Gen. et Sp. 4: 124. ed. fol.
1818. Colombia.

Ageratina grandidentata (A.P.Decandolle) R.M.King & H.Robinson,
comb. nov. Eupatorium grandidentatum A.P.Decandolle, Prodr.
5: 167. 1836. Mexico.

Ageratina ibaquensis (Schultz-Bip. ex Hieron.) R.M.King & H.
Robinson, comb. nov. Eupatorium ibaquense Schultz-Bip. ex
Hieron. in Urban, Engl. Bot. Jahrb. 40: 384. 1908.
Venezuela.

Ageratina iodotricha (B.L.Robinson) R.M.King & H.Robinson, comb.
nov. Eupatorium iodotrichum B.L.Robinson, Proc. Amer. Acad.
55: 19. 1919. Ecuador.

Ageratina lobulifera (B.L.Robinson) R.M.King & H.Robinson, comb.
nov. Eupatorium lobuliferum B.L.Robinson, Contr. Gray
Herb. n.s. 77: 24. 1926. Peru.

Ageratina lorentzii (Hieron.) R.M.King & H.Robinson, comb. nov.
Eupatorium lorentzii Hieron., Engl. Bot. Jahrb. 22: 787.
1897. Argentina.

Ageratina luciae-brauniae (Fernald) R.M.King & H.Robinson, comb.
nov. Eupatorium luciae-brauniae Fernald, Rhodora 44: 463.
1942. Kentucky.

Ageratina malacolepis (B.L.Robinson) R.M.King & H.Robinson, comb.
nov. Eupatorium malacolepis B.L.Robinson, Proc. Amer. Acad.
44: 618. 1909. Mexico.

Ageratina mariara (B.L.Robinson) R.M.King & H.Robinson, comb.
nov. Eupatorium mariarum B.L.Robinson, Proc. Amer. Acad.
36: 481. 1901. Mexico.

Ageratina muelleri (Schultz-Bip. ex Klatt) R.M.King & H.Robinson,
comb. nov. Eupatorium muelleri Schultz-Bip. ex Klatt,
Leopoldina 20: 90. 1884. Mexico.

Ageratina oligocephala (A.P.Decandolle) R.M.King & H.Robinson,
comb. nov. Eupatorium oligocephalum A.P.Decandolle, Prodr.
5: 166. 1836. Mexico.

Ageratina pacifica (B.L.Robinson ex I.M.Johnston) R.M.King &
H.Robinson, comb. nov. Eupatorium pacificum B.L.Robinson
ex I.M.Johnston, Proc. Calif. Acad. Sci. 20: 99. 1931.
Mexico.

Ageratina pampalcensis (B.L.Robinson) R.M.King & H.Robinson,
comb. nov. Eupatorium pampalcense B.L.Robinson, Contr.
Gray Herb. n.s. 104: 24. 1934. Peru.

Ageratina paupercula (A.Gray) R.M.King & H.Robinson, comb. nov.
Eupatorium pauperculum A.Gray, Proc. Amer. Acad. 17: 205.
1881-82. Arizona, Mexico.

Ageratina pazcuanensis (H.B.K.) R.M.King & H.Robinson, comb. nov.
Eupatorium pazcuanense H.B.K., Nov. Gen. et Sp. 4: 123.
ed. fol. 1818. Mexico.

Ageratina photina (B.L.Robinson) R.M.King & H.Robinson, comb.
nov. Eupatorium photinum B.L.Robinson, Proc. Amer. Acad.
35: 338. 1900. Mexico.

Ageratina pichinchensis (H.B.K.) R.M.King & H.Robinson, comb.
nov. Eupatorium pichinchense H.B.K., Nov. Gen. et Sp. 4:
122. ed. fol. 1818. Ecuador, Colombia.

Ageratina prunellaefolia (H.B.K.) R.M.King & H.Robinson, comb.

- nov. Eupatorium prunellaefolium H.B.K., Nov. Gen. et Sp.
4: 123. ed. fol. 1818. Mexico.
- Ageratina psilodora (B.L.Robinson) R.M.King & H.Robinson, comb.
nov. Eupatorium psilodorum B.L.Robinson, Proc. Amer. Acad.
55: 27. 1919. Colombia.
- Ageratina purpusii (Brandegee) R.M.King & H.Robinson, comb. nov.
Eupatorium purpusii Brandegee, Erythea 7: 3. 1899. Baja
California.
- Ageratina ramonensis (B.L.Robinson) R.M.King & H.Robinson, comb.
nov. Eupatorium ramonense B.L.Robinson, Proc. Amer. Acad.
44: 619. 1909. Mexico.
- Ageratina repens (B.L.Robinson) R.M.King & H.Robinson, comb. nov.
Fleischmannia repens B.L.Robinson, Proc. Amer. Acad. 54:
262. 1918. Mexico.
- Ageratina rhodopappa (B.L.Robinson) R.M.King & H.Robinson, comb.
nov. Eupatorium rhodopappum B.L.Robinson, Contr. Gray
Herb. n.s. 77: 31. 1926. Colombia.
- Ageratina rhyphodes (B.L.Robinson) R.M.King & H.Robinson, comb.
nov. Eupatorium rhyphodes B.L.Robinson, Proc. Amer. Acad.
55: 28. 1919. Ecuador.
- Ageratina rhytidodes (B.L.Robinson) R.M.King & H.Robinson, comb.
nov. Eupatorium rhytidodes B.L.Robinson, Contr. Gray Herb.
n.s. 77: 33. 1926. Peru.
- Ageratina riparia (Regel.) R.M.King & H.Robinson, comb. nov.
Eupatorium riparium Regel. Gartenfl. 15: 324. 1866.
Mexico, W.Ind., Pac. Isl., Australia. Widely adventive.
- Ageratina rivalis (Greenman) R.M.King & H.Robinson, comb. nov.
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1897. Arizona, Mexico.
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ser. 2, 6: 38. 1901. Brit. Guiana, Venezuela.
- Ageratina rufa (E.L.Greene) R.M.King & H.Robinson, comb. nov.
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1903. Mexico.

- Ageratina schaffneri (Schultz-Bip. ex B.L.Robinson) R.M.King & H. Robinson, comb. nov. Eupatorium schaffneri Schultz-Bip. ex B.L.Robinson, Proc. Amer. Acad. 27: 171. 1892. Mexico.
- Ageratina scopulora (Weddell) R.M.King & H.Robinson, comb. nov. Eupatorium scopulorum Weddell, Chlor. Andina 1: 216. 1857. Peru.
- Ageratina skutchii (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium skutchii B.L.Robinson, Contr. Gray Herb. n.s. 104: 27. 1934. Mexico, C.Amer.
- Ageratina sodiroi (Hieron.) R.M.King & H.Robinson, comb. nov. Eupatorium sodiroi Hieron. in Sodiro, Engl. Bot. Jahrb. 29: 12. 1900. Ecuador.
- Ageratina sotarensis (Hieron.) R.M.King & H.Robinson, comb. nov. Eupatorium sotarense Hieron., Engl. Bot. Jahrb. 21: 333. 1895 (as E. soratense). Colombia.
- Ageratina sternbergiana (A.P.Decandolle) R.M.King & H.Robinson, comb. nov. Eupatorium sternbergianum A.P.Decandolle, Prodr. 5: 167. 1836. Peru.
- Ageratina subcordata (Bentham ex Oerst.) R.M.King & H.Robinson, comb. nov. Eupatorium subcordatum Bentham ex Oerst., Kjoeb. Vidensk. Meddel. 77. 1852. Costa Rica.
- Ageratina tambillensis (Hieron.) R.M.King & H.Robinson, comb. nov. Eupatorium tambillense Hieron. in Urban, Engl. Bot. Jahrb. 40: 380. 1908. Peru.
- Ageratina tarmensis (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium tarmense B.L.Robinson, Contr. Gray Herb. n.s. 104: 28. 1934. Peru.
- Ageratina tenuis (R.E.Fries) R.M.King & H.Robinson, comb. nov. Eupatorium tenue R.E.Fries, Arkiv. Bot. 5(13): 9. 1906. Argentina.
- Ageratina tonduzii (Klatt) R.M.King & H.Robinson, comb. nov. Eupatorium tonduzii Klatt, Bot. Beibl. Leopoldina 1895: 4. 1895. Costa Rica.
- Ageratina vallincola (A.P.Decandolle) R.M.King & H.Robinson, comb. nov. Eupatorium vallincola A.P.Decandolle, Prodr. 5: 168. 1836. Peru.
- Ageratina ventillana (Cuatrecasas) R.M.King & H.Robinson, comb. nov. Eupatorium ventillanum Cuatrecasas, Ann. Missouri

Bot. Gard. 52: 305. 1965. Peru.

Ageratina vulcanica (Benth. ex Oerst.) R.M. King & H. Robinson, comb. nov. Eupatorium vulcanicum Benth. ex Oerst., Kjoeb. Vidensk. Meddel. 78. 1852. C. Amer.

Ageratina xanthochlora (B.L. Robinson) R.M. King & H. Robinson, comb. nov. Eupatorium xanthochlorum B.L. Robinson, Contr. Gray Herb. n.s. 77: 44. 1926. Mexico.

Ageratina zinniifolia (B.L. Robinson) R.M. King & H. Robinson, comb. nov. Eupatorium zinniifolium B.L. Robinson, Proc. Amer. Acad. 54: 261. 1918. Colombia.

Ageratina zunilana (Standley & Steyermark) R.M. King & H. Robinson, comb. nov. Eupatorium zunilanum Standley & Steyermark, Field Mus. Publ., Bot. 23: 191. 1944. Guatemala.

Subgenus Klattiella R.M. King & H. Robinson, subg. nov.

Plantae suffrutescentes; corolla inferne perangustata, in parte angustata distincte pubescens, lobis quam fauce aequilongis vel longioribus extus glanduliferis intus obsolete late papillatis; appendices styli valde papillatae; achaenia glandulifera et setifera; carpodium aliquantum breve rotundatum, cellulis quadratis vel oblongis; setae pappi aliquantum persistentes. 2 species. Type: Eupatorium anisochromum.

Ageratina anisochroma (Klatt) R.M. King & H. Robinson, comb. nov. Eupatorium anisochromum Klatt., Bull. Soc. Bot. Belg. 31: 186. 1892 (1893). Costa Rica.

Ageratina paucibracteata (Alain) R.M. King & H. Robinson, comb. nov. Eupatorium paucibracteatum Alain, Contr. Ocas. Mus. Hist. Nat. Coleg. "De La Salle" 18: 8. 1960. Cuba.

Subgenus Neogreenella R.M. King & H. Robinson, subg. nov.

Plantae herbaceae vel frutescentes; corolla inferne plerumque non angustata, lobis quam fauce brevioribus extus glanduliferis vel setiferis vel glabris intus dense vel laxe papillatis; filamenta antherarum in parte inferiore longa; appendices styli plerumque valde papillatae raro leviter papillatae; achaenia glandulifera vel setifera; carpodium breve rotundatum, cellulis plerumque quadratis; setae pappi aliquantum persistentes. 113 species. Type: Eupatorium wrightii.

Southward the subgenus includes many more shrubby species with more elliptical leaves. Such plants may represent the more

primitive element in the genus. Also, in Peru, a small group of species including A. cuzcoensis, A. pentlandiana, A. simulans, and A. stictophylla is rather distinct in its less papillose style branches and its lack of a distinct styler node.

Ageratina acutidentata (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium acutidentatum B.L.Robinson, Proc. Amer. Acad. 43: 29. 1907. Mexico.

Ageratina adenachaenia (Schultz-Bip. ex Klatt) R.M.King & H. Robinson, comb. nov. Eupatorium adenachaenium Schultz-Bip. ex Klatt, Leopoldina 20: 75. 1884. Mexico.

Ageratina aegiophylla (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium aegiophyllum B.L.Robinson, Proc. Amer. Acad. 35: 329. 1900. Mexico.

Ageratina ampla (Benth) R.M.King & H.Robinson, comb. nov. Eupatorium amplum Benth, Pl. Hartw. 200. 1845. Colombia.

Ageratina angustifolia (H.B.K.) R.M.King & H.Robinson, comb. nov. Mikania angustifolia H.B.K., Nov. Gen. et Sp. 4: 138. ed. fol. 1818. Colombia.

Ageratina arbutifolia (Benth) R.M.King & H.Robinson, comb. nov. Eupatorium arbutifolium Benth, Pl. Hartw. 199. 1845. Colombia.

Ageratina aristei (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium aristei B.L.Robinson, Proc. Amer. Acad. 55: 6. 1919. Colombia.

Ageratina baccharoides (H.B.K.) R.M.King & H.Robinson, comb. nov. Eupatorium baccharoides H.B.K., Nov. Gen. et Sp. 4: 132. ed. fol. 1818. Colombia.

Ageratina betulaeifolia (E.L.Greene) R.M.King & H.Robinson, comb. nov. Kyrstenia betulaeifolia E.L.Greene, Leafl. Bot. Obs. Crit. 1: 10. 1903. Mexico.

Ageratina blepharilepis (Schultz-Bip.) R.M.King & H.Robinson, comb. nov. Eupatorium blepharilepis Schultz-Bip. in Seemann, Bot. Voyag. Herald 300. 1856. Mexico.

Ageratina brandegeana (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium brandegeanum B.L.Robinson, Contr. Gray Herb. n.s. 68: 10. 1923. Mexico.

Ageratina brevipes (A.P.Decandolle) R.M.King & H.Robinson, comb. nov. Eupatorium brevipes A.P.Decandolle, Prodr. 5: 168.

1836. Mexico.

Ageratina caeciliae (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium caeciliae B.L.Robinson, Contr. Gray Herb. n.s. 90: 23. 1930. Guatemala.

Ageratina calaminthaefolia (H.B.K.) R.M.King & H.Robinson, comb. nov. Eupatorium calaminthaefolium H.B.K., Nov. Gen. et Sp. 4: 129. ed. fol. 1818. Mexico.

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Ageratina chapalensis (Watson) R.M.King & H.Robinson, comb. nov. Eupatorium chapalense Watson, Proc. Amer. Acad. 26: 138. 1891. Mexico.

Ageratina collodes (B.L.Robinson & Greenman) R.M.King & H.Robinson, comb. nov. Eupatorium collodes B.L.Robinson & Greenman, Amer. Journ. Sci. 50: 152. 1895. Mexico.

Ageratina crassiceps (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium crassiceps B.L.Robinson, Contr. Gray Herb. n.s. 80: 17. 1928. Colombia.

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Ageratina crenaea (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium crenaeum B.L.Robinson, Proc. Amer. Acad. 35: 333. 1900. Mexico.

Ageratina cuzcoensis (Hieron.) R.M.King & H.Robinson, comb. nov. Eupatorium cuzcoense Hieron. in Urban, Engl. Bot. Jahrb. 40: 376. 1908. Peru.

Ageratina deltoidea (Jacquin) R.M.King & H.Robinson, comb. nov.
Eupatorium deltoideum Jacquin, Pl. Hort. Schoenb. Wien 3:
63. 1798 (1803). Mexico.

Ageratina dendroides (Spreng.) R.M.King & H.Robinson, comb. nov.
Eupatorium dendroides Spreng., Systema Vegetabilium 3: 415.
1826. Ecuador.

Ageratina desquamans (B.L.Robinson) R.M.King & H.Robinson, comb.
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Ageratina dictyoneura (Urban) R.M.King & H.Robinson, comb. nov.
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Haiti.

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Ageratina durangensis (B.L.Robinson) R.M.King & H.Robinson, comb.
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nov. Eupatorium etlense B.L.Robinson, Contr. Gray Herb.
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Ageratina exserto-venosa (Klatt) R.M.King & H.Robinson, comb.
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Eupatorium fastigiatum H.B.K., Nov. Gen. et Sp. 4: 125. ed.
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Ageratina gynoxoides (Weddell) R.M.King & H.Robinson, comb. nov. Eupatorium gynoxoides Weddell, Chlor. Andina 1: 216. 1857. Colombia.

Ageratina hartii (Urban) R.M.King & H.Robinson, comb. nov. Eupatorium hartii Urban, Symb. Ant. 3: 395. 1903. Jamaica.

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Ageratina hebes (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium hebes B.L.Robinson, Contr. Gray Herb. n.s. 75: 7. 1925. Mexico.

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Ageratina herbacea (A.Gray) R.M.King & H.Robinson, comb. nov. Eupatorium ageratifolium var. herbaceum A.Gray, Smiths. Contr. Knowl. 5 (6): 74. 1853. New Mexico.

Ageratina hidalgensis (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium hidalgense B.L.Robinson, Contr. Gray Herb. n.s. 75: 8. 1925. Mexico.

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Ageratina illita (Urban) R.M.King & H.Robinson, comb. nov.

Eupatorium illitum Urban, Symb. Ant. 3: 401. 1903. Santo Domingo.

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Ageratina loeseneri (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium loeseneri B.L.Robinson, Proc. Amer. Acad. 35: 336. 1900. Mexico.

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nov. Eupatorium macbridei B.L.Robinson, Contr. Gray Herb.
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- Ageratina mairetiana (A.P.Decandolle) R.M.King & H.Robinson,
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- Ageratina mortoniana (Alain) R.M.King & H.Robinson, comb. nov.
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villosum Sw. We consider this impossible in view of the
totally different anatomical characters of E. villosum,
none of which appear in Ageratina mortoniana.
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nov. Eupatorium ocanense B.L.Robinson, Contr. Gray Herb.
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- Ageratina occidentalis (W.J.Hooker) R.M.King & H.Robinson, comb.
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305. 1833. W. United States.
- Ageratina ovilla (Standley & Steyermark) R.M.King & H.Robinson,
comb. nov. Eupatorium ovillum Standley & Steyermark,
Field Mus. Publ., Bot. 22: 305. 1940. Guatemala.
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Ageratina pomaderriifolia (Benth) R.M.King & H.Robinson, comb. nov. Eupatorium pomaderriifolium Benth, Pl. Hartw. 199. 1845. Colombia.

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Ageratina tetragona (Schrad.) R.M.King & H.Robinson, comb. nov.
Eupatorium tetragonum Schrad., Ind. Sem. Hort. Gotting.
1830 ex Linnaea 6: 72. 1831. Mexico.

Ageratina theaeifolia (Benth) R.M.King & H.Robinson, comb. nov.
Eupatorium theaeifolium Benth, Pl. Hartw. 199. 1845.
Colombia, Venezuela.

Ageratina thyrsoiflora (E.L.Greene) R.M.King & H.Robinson, comb.
nov. Kyrstenia thyrsoiflora E.L.Greene, Leafl. Bot. Obs.
Crit. 1: 9. 1903. Mexico.

Ageratina tinifolia (H.B.K.) R.M.King & H.Robinson, comb. nov.
Eupatorium tinifolium H.B.K., Nov. Gen. et Sp. 4: 133. ed.
fol. 1818. Colombia.

Ageratina tomentella (Schrad.) R.M.King & H.Robinson, comb. nov.
Eupatorium tomentellum Schrad., Ind. Sem. Hort. Gotting.
1833: 3. 1833. Mexico.

Ageratina tristis (A.P.Decandolle) R.M.King & H.Robinson, comb.
nov. Eupatorium triste A.P.Decandolle, Prodr. 5: 166.
1836. Jamaica.

Ageratina urbanii (Ekman ex Urban) R.M.King & H.Robinson, comb.
nov. Eupatorium urbanii Ekman ex Urban, Arkiv Bot. 23A
(11): 55. 1931. Haiti.

Ageratina vacinniaefolia (Benth) R.M.King & H.Robinson, comb.
nov. Eupatorium vacinniaefolium Benth, Pl. Hartw. 200.
1845. Colombia.

Ageratina venulosa (A.Gray) R.M.King & H.Robinson, comb. nov.
Eupatorium venulosum A.Gray, Proc. Amer. Acad. 21: 384.
1886. Mexico.

Ageratina vernalis (Vatke & Kurtz) R.M.King & H.Robinson, comb.
nov. Eupatorium vernale Vatke & Kurtz, Ind. Sem. Hort.
Berol. 1871: Append. 2. 1871. Mexico, Guatemala.

Ageratina vernicosa (Schultz-Bip. ex Greenman) R.M.King &
H.Robinson, comb. nov. Eupatorium vernicosum Schultz-Bip.
ex Greenman, Zoe 5: 186. 1904. Mexico.

Ageratina viburnoides (A.P.Decandolle) R.M.King & H.Robinson,
comb. nov. Eupatorium viburnoides A.P.Decandolle, Prodr.
5: 171. 1836. Mexico.

Ageratina viscosa (H.B.K.) R.M.King & H.Robinson, comb. nov.
Eupatorium viscosum H.B.K., Nov. Gen. et Sp. 4: 129. ed.
fol. 1818. Colombia.

Ageratina wrightii (A.Gray) R.M.King & H.Robinson, comb. nov.
Eupatorium wrightii A.Gray, Smiths. Contr. Knowl. 3: 87.
1850. W. United States, Mexico.

Subgenus Pachythamnus R.M.King & H.Robinson, subg. nov.

Plantae frutescentes vel subarborescentes; caulis distincte incrassatus; folia facile decidua per anthesin plerumque absentia; corolla inferne vix angustata extus interdum rare setifera, cellulis apicalibus protuberantibus, lobis intus valde et dense papillatis; filamenta antherarum in parte inferiore brevia; appendices styli leniter papillatae; achaenia setifera; carpodium breve rotundatum, cellulis quadratis; setae pappi aliquantum persistentes. 1 species. Type: Eupatorium crassirameum.

Ageratina crassiramea (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium crassirameum B.L.Robinson, Proc. Amer. Acad. 35: 332. 1900. Mexico, C.Amer.

Species synonymized

E. amplifolium A.Gray = A. rubricaulis
E. durandii Klatt = A. anisochroma
E. remyanum Philippi = A. glechonophylla

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ADDITIONAL NOTES ON THE ERIOCAULACEAE. XXVI

Harold N. Moldenke

ERIOCAULON SEPTANGULARE With.

Additional bibliography: Wardlaw, *Morphogen.* 48 & 49, fig. F. 1968; Moldenke, *Phytologia* 19: 70, 86, 87, 89, 90, & 105--109. 1969; G. W. Prescott, *How to Know Aquat. Pl.* 133, 134, & 164, fig. 146. 1969.

Additional illustrations: Wardlaw, *Morphogen.* 48, fig. F. 1968.

The Eriocaulon pellucidum Michx., E. pumilum Raf., E. noveboracens Pluk., and E. septangulare var. natans Hexamer & Meier previously regarded by me as synonyms of E. septangulare With. are now excluded from this synonymy and are placed in that of E. pellucidum Michx. On the other hand, the E. decangulare Lightf., previously regarded by me as a synonym of E. pellucidum, belongs in the synonymy of E. septangulare With., sens. strict., instead, being based on Scottish plants.

The Praeger (1910) reference in the bibliography of E. septangulare is sometimes cited as page "301", but should be 302; the Curtis (1821) reference is sometimes quoted as "1819--1821", but the plate in question seems to have appeared in 1821; the Johnson & Sowerby (1860) reference is sometimes quoted as "1858--1860", but the figure involved here seems to have appeared first in 1860.

The situation relative to the generic name, Cespa, and the binomial, Cespa aquatica, is summarized as follows by Druce (1909): "Note on Eriocaulon septangulare....The above plant, sometimes called the pipewort, is one of our most singular species, the only British representative of a somewhat large genus spread widely over the globe. Our British plant is only known to occur on the west coast of Ireland (where it was first found in 1801), from Cork to Donegal, and on the island of Skye, whence it was recorded in the *Philosophical Transactions*, lix, p. 241, being found by James Robertson in 1768; but Sir W. Hooker, in the '*Flora Scotica*', l., 270, says it was first found by Sir John Macpherson in 1764. Mr. Clarke, in his '*First Records*', gives the date of the publication of the discovery as 1770; the date of the publication of the name as given above is by Withering in the first edition of the '*Botanical Arrangement*' of 1776. In some recent investigations into the works and life of Sir John Hill, a somewhat notorious doctor and botanist of the eighteenth century, I have come across an interesting fact. In my copy -- which contains the autograph of the botanist Bishop (Goodenough) of Carlisle -- of Hill's '*Herbarium Britannicum*', fol. l., 1769, there is a figure with dissections, of Eriocaulon septangulare, which is labelled '*CESPA*, Tab. 66, Pa. 91', at top, and below the figure the name '*Cespa aquatica*, Water Turffwort'.

"A curious point is that there is no description of the plant

on the page 91 to which the plate refers, nor is the name in the index. Doubtless Hill intended to describe it, but this work, as the many misprints show, was rushed through at great speed, his literary output at that time being most voluminous. But the fact remains that the plate, properly labelled, with adequate dissections, makes it a valid publication according to the 'Vienna Actes', but as Eriocaulon, L., is an older generic name than Cespa (so named, doubtless from its tufted growth), Hill's generic name is invalid. The trivial name aquatica is, however, available for citation, and as it is the earliest known, it would appear that our pipewort should be called Eriocaulon aquaticum (Hill)." In the Harvard University botanical library copy of this work, plate 66 depicts only Eryngium maritimum, the sea-holly, and page 96, cited by some authors, also has on it only descriptions of other taxa.

The species has been collected at altitudes up to 100 meters. Vernacular names recorded for it are "jointed pipewort", "pipewort", and "water turffwort". White (1968) reports it as "abundant locally in sphagnum bog" in County Mayo, Ireland. It has been found in fossil form in Ireland, too. However, the fossil described under this name by Penhallow (1899) from Taylor Brickyard, in the Don Valley of Ontario, Canada, Pleistocene formation, is certainly E. pellucidum. Zinderenbakker (1953) states that the pollen was described by Erdtman in 1943. Clapham, Tutin, & Warburg (1962) report its chromosomes as $2n = 64$. Hare (1950) describes the gross morphology and anatomy of the rhizome, adventitious roots, leaves, inflorescences, and flowers. Details of seed structure, embryology, and germination are also given by him, and the plant's adaptations to its aquatic environment are discussed, especially its adaptation to wave action and upthrust from water. Mackay (1836) says of this species "Lakes in Cunnemara, where it was first observed by Doctor Wade, abundant. Fl. Aug."

Markgraf (1952) tells us that the flora of Ireland includes several elements common to North America and northern Europe, including Najas flexilis, Lobelia dortmanna, Eriocaulon septangulare, and two species of Spiranthes. These are supposed by him to be relicts from the Miocene when the species in question might have lived north of the Atlantic, later migrating southwards to both the east (Ireland) and west (North America). This concept rejects the Wegener theory of floating continents.

Good (1964) reminds us that Eriocaulon septangulare was included in the six species of Matthew's oceanic northern element found on the west side of Great Britain and otherwise only in North America -- the other five being Juncus dudleyi, J. tenuis, Sisyrinchium bermudianum, Spiranthes gemmipara, and S. romanzoffiana. However, Löve & Löve (1958) show that the Eriocaulon and Sisyrinchium species are NOT identical on the two sides of the Atlantic. Spiranthes gemmipara is also no longer listed in floras of the northeastern North American region. Melchior (1964)

also reminds us that the so-called E. septangulare plants of North America have only half the chromosome count of those in Europe.

Kunth (1841) maintains that E. leucomelas Steud. is [closely] related to E. septangulare, but that the latter species has "foliis latioribus et scapis longioribus".

The Hooker collection cited below is inscribed "very rare". The Martens collection bears an inscription "E. (non septangulare auct.) sp. nov. a McKay Flora Hibernica descripta". The P. B. Webb 20 has a printed "exsiccatae" label giving as synonym "E. decangulare Hull, Brit. Fl. p. 29 (1799) non L. Sp. Pl." In some quarters such names on printed exsiccatae labels are regarded as valid publication. The D. Turner [1801] collection, cited below, is represented by two sheets in the herbarium of the Botanischer Garten und Museum at Berlin — one is labeled "E. decangulare Huds." and the other as "E. septemangulare".

It should be pointed out that practically all of the collections cited by me in these notes as E. pellucidum were originally identified and distributed in herbaria as E. septangulare. Also, W. C. Coker s.n. [4/3/1910] & s.n. [June 27, 1931] and Tharp s.n. [Bellville, 5/4/40], distributed as E. septangulare, are actually E. compressum Lam.; F. A. Barkley 13543, W. M. Canby s.n. [Pine barrens, Aug. 1861], and W. R. Taylor T.1073 are E. decangulare L.; E. L. Little Jr. s.n. [Jul. 14, 1929] is E. kornickianum Van Heurck & Muell.-Arg.; R. F. Thorne 1581, 4370, & 5022 and W. Wolf s.n. [Summerdale, July 30, '26] are E. lineare Small; Widgren s.n. is E. modestum Kunth; R. C. Alexander s.n. [Redbank, 3 Sept. '69], E. H. Day s.n. [17.7.82], Martindale s.n. [Camden, Sep. 1877], and Radford 44454 are E. parkeri B. L. Robinson; Herb. Link s.n. is E. sollyanum Royle; Lundell & Lundell 11152 and Olds s.n. [Montgomery, 3.20.94] are Lachnocaulon anceps (Walt.) Morong; McCarthy s.n. [Wilmington, June 1892] is Lachnocaulon minus (Chapm.) Small; and Adrien 3308 is a species of Lobelia. In the McGill University herbarium there is actually a specimen of Nuphar advena (Ait.) Ait. f. labelled as Eriocaulon septangulare, doubtless through a crossing of labels in the mounting process.

Additional citations: ISLE OF SKYE: Balfour s.n. [1838] (B), s.n. (S); Boott s.n. (Ms—15482); W. Brand s.n. [Sept. 8, 1835] (M), s.n. [1836] (Mu); Christy s.n. [1829] (Ms—15483); Collector undetermined s.n. [Aug. 1857] (C); F. C. Crawford s.n. [16 August 1898] (Go), s.n. [8th Aug. 1907] (Go); E. Durand s.n. (Ms—15486); O. G. E. Erdtman s.n. [July 1964] (S); Farquharson s.n. [Aug. 11th, 1852] (Go); Gardner s.n. [August 1845] (Go); Graham s.n. [1830] (Ms—15843); Herb. Braun s.n. (B); Herb. Schwägrichen s.n. (Mu—319); Hooker s.n. (B, Ms—15483, S, T); Lawson s.n. [Skye] (Mm—7955); Muirhead 231.5 (Go); Stables s.n. [Sept. 1835]

(M), s.n. [9.1836] (M); D. Turner s.n. [1801] (B, B); Tyacke s.n. [1828] (M); Walker-Arnott s.n. [1837] (M); I. Ward s.n. [Ecosse] (Br); H. C. Watson s.n. (Ut—302); Winterbottom 20 (S). EIRE: Galway Co.: Armitage s.n. [Galway, Aug. 1872] (Mm—7955); A. W. Bennett s.n. [Cunnamara, 8/9/1883] (Mu—326); Colgan 3200 (B, B, Mu—355), s.n. [August 13, 1897] (B, Go); Collector undetermined s.n. [Galway, Aug. 1868] (Mi); Groves & Groves s.n. [Galway, 8. VIII.1892] (S); Herb. Braun s.n. [Galway] (B); Herb. Inst. Bot. Univ. Brux. s.n. [Lake of Recess, 9.VIII.04] (Br); Herb. Shuttleworth s.n. [Cunnamara, 1836] (Mu), s.n. [Cunnamara] (M); J. Kelly s.n. [Roundstone, Sept. 1888] (S); N. J. Kelly s.n. (B); Leitch H.16 (Go); C. A. M. Lindman s.n. [22.8.1911] (S, S); Linton s.n. [12.VIII.85] (B); Nilsson & Degelius s.n. [West Galway, 1/8/1939] (S); Scouler s.n. [Cunnamara] (S, S); S. A. Stewart s.n. [29/7/1867] (B). Kerry Co.: Hultén s.n. [July 21, 1949] (S); D. A. Webb s.n. [Caragh Lake, 28/7/1951] (S). Mayo Co.: Hultén s.n. [July 15, 1949] (S). County undetermined: J. H. Balfour s.n. [Aug. 1838] (M, Ut—423); J. Ball s.n. [Sept. 1837] (C); Bentham 12 (S), s.n. [Hibernia] (Ut—301); Druce 2526 (S); Farre s.n. [7.1837] (S); J. D. Hooker 1149 (S); P. Martens s.n. (Br); Morren s.n. (Br); Nilsson & Degelius s.n. [Roundtree, 1/8/1933] (Go, S, S); D. Oliver 1149 (S); C. Skottsberg s.n. [16/8/1958] (Go); Tidestrom 11236 (Mi); P. B. Webb 20 (B, Br, Br, Go, S); W. Wilson s.n. [August 1823] (Ws). LOCALITY OF COLLECTION UNDETERMINED: Arnott s.n. [Scotia et Hibernia] (B), s.n. (Ms—15843); Herb. Bot. Soc. London 1149 (M); Herb. Swartz s.n. (S); W. J. Hooker s.n. [England] (Ws).

ERIOCAULON SESSILE Meikle

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The species is known thus far only from French Guinea.

ERIOCAULON SETACEUM L.

Synonymy: Tsjeru-kotsjiletti-pullu Rheede apud K. Comm., Fl. Malab. 67. 1696. Tsjéru Cotsiiletti-pullu Rheede, Hort. Malab. 12: pl. 68. 1703. Randalia malabarica, capillaceo folio Petiv., Gazoph. 1: pl. 33, fig. 10. 1706. Penda H. Herm., Mus. Zeyl., ed. 1, 8. 1717. Gramen junceum, foliis capillaceis sericeis, capitulis minus rotundis J. Burm., Thes. Zeyl. 109. 1737. Gramen junceum, chamaemeli capitulis albis aphyllis, minus J. Burm., Thes. Zeyl. 109. 1737. Statice minima indiae orientalis, capillaceis foliis capitulis argenteis Amm., Stirp. Rar. [Herb.] 396, pl. 21. 1739. Eriocaulon culmo sexangulari, foliis setaceis L.,

Fl. Zeyl., ed. 1, 20—21. 1747. Tsceru-kotsyelleti-pullu Rheede apud L., Fl. Zeyl., ed. 1, 21, in syn. 1747. Tsieru-kotsijelleti-pullu Rheede apud L., Sp. Pl., ed. 1, pr. 1, 1: 87, in syn. 1753. Eriocavlon setaceum Crantz, Inst. Rei Herb. 1: 360. 1766. Tsieru-kotsi-jelleti pullu Rheede apud Crantz, Inst. Rei Herb. 1: 360, in syn. 1766. Eriocavlon setaceum L. apud Reich. in L., Syst. Pl. 1: 244. 1779. Tsieru-kotsi-telleti pullu Rheede apud Mart. in Wall., Pl. Asiat. Rar. 3: 29, in syn. 1832. Eriocaulon capillus-naiadis Hook. f., Fl. Brit. Ind. 6: 572 & 769. 1893. Eriocaulon setaceum Wall. apud Hook. f., Fl. Brit. Ind. 6: 572, in syn. 1893 [not E. setaceum Auct. ex Backer & Bakh., 1968, nor Auct. ex Ruhl., 1903, nor Benth., 1893, nor Heyne, 1832, nor Hook. f., 1959, nor Kunth, 1860, nor Lour., 1790, nor Rottl., 1960, nor Steen., 1960, nor Wight, 1832, nor Willd., 1959]. Eriocaulon capillus najadis Hook. f. apud Ruhl. in Engl., Pflanzenreich 13: (4-30): 89 & 285. 1903. Eriocaulon capillus-naidis Hook. f. apud Fyson, Journ. Indian Bot. 2: 193, in syn. 1921. Eriocaulon setaceum f. setaceum Haines, Bot. Bihar & Orissa 1067. 1924. Eriocaulon setaceum f. capillus-naiadis Haines, Bot. Bihar & Orissa 1067. 1924. Eriocaulon setaceum Crantz ex Moldenke, Résumé 292, in syn. 1959. Eriocaulon setaceum f. capillis-naiadis Haines ex Moldenke, Résumé Suppl. 17: 11, in syn. 1968. Eriocaulon myriophyllum Wall., in herb.

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Fragm. 1: 94. 1859; C. Müll. in Walp., Ann. 5: 925 & 931 (1860) and 6: 1171. 1861; Körn. in Mart., Fl. Bras. 3 (1): 476. 1863; Thwait. & Hook. f., Enum. Pl. Zeyl. 341. 1864; Le Maout & Decne., Trait. Gén. Bot. 598. 1868; Hook. in Le Maout, Decne., & Hook., Gen. Syst. Bot. 598. 1873; Benth., Fl. Austral. 7: 190—192 & 792. 1878; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 26 & 27. 1888; Hook. f., Fl. Brit. Ind. 6: 572 & 769. 1893; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 879. 1893; Baillon, Hist. Pl. 12: 400. 1894; Hook. f. in Trimen, Handb. Fl. Ceylon 5: [1]—3 & 412. 1900; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 158. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 18, 64, 89, 90, & 287, fig. 9. 1903; Prain, Beng. Fl., ed. 1, 1127. 1903; C. H. Wright, Journ. Linn. Soc. Lond. Bot. 36: 200. 1903; H. Lecomte, Journ. de Bot. 21: 89 & 90. 1908; H. Lecomte, Fl. Gén. Indo-Chine 7: 2 & 5. 1912; F. M. Bailey, Compreh. Cat. Queensl. Pl. 584 & 586, fig. 564. 1913; Fyson, Journ. Indian Bot. 2: 193, pl. 1. 1921; Haines, Bot. Bihar & Orissa 1066—1067. 1924; Stapf, Ind. Lond. 3: 91. 1930; C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. 1, 9: 1606 & 1618. 1931; Van Steenis, Trop. Natuur 25: 107. 1936; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 2, 158. 1941; Castell. in Descole, Gen. & Sp. Pl. Argent. 3: 76, 77, & [103]. 1945; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 879. 1946; Moldenke, Known Geogr. Distrib. Erioc. 23, 24, 26, 28, 33, & 40. 1946; Backer, Noodfl. Java 10a: fam. 214: 1. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 125, 127, 129, 130, 136, 153, & 206. 1949; Moldenke, Phytologia 3: 397. 1950; Razi, Journ. Mysore Univ. 11 (1): 16. 1950; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 129, pl. 7, fig. 5. 1955; C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. 2, 8 [3]: 1120, 1126, & 1333. 1956; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 158. 1959; Moldenke, Résumé 159, 162, 165—167, 176, 209, 286, 292, & 483. 1959; Moldenke, Résumé Suppl. 1: 11 (1959) and 2: 9. 1960; Van Royen, Blumea 10: 132 & 133. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 879. 1960; D. N. F. Kiehl, Blumea 10: 657. 1960; Moldenke, Résumé Suppl. 3: 26 (1962) and 6: 8. 1963; Prain, Beng. Fl., ed. 2, 2: 848. 1963; Bhattacharyya, Bull. Bot. Surv. India 5: 42, 59, & 62 (1963) and 6: 196 & 208. 1964; Koyama in Kitamura, Murata, & Koyama, Col. Illustr. Herb. Pl. Japan 3: 178. 1964; Thanikaimoni, Pollen & Spores 7: 186. 1965; J. S. Beard, Descrip. Cat. W. Austral. Pl. 9. 1965; Berhaut, Fl. Sénégal, ed. 2, 312. 1967; Moldenke, Résumé Suppl. 15: 8 & 14 (1967) and 17: 11. 1968; Moldenke, Phytologia 18: 102, 169, 173, 243, 244, 280, 429, & 433 (1969) and 19: 20, 26, 38, 39, 70, & 98. 1969.

Illustrations: Rheede, Hort. Malab. 12: pl. 68. 1703; Petiv., Gazoph. 1: pl. 33, fig. 10. 1706; Gaertn., Fruct. & Sem. Pl. 2: pl. 83. 1791; W. Griff., Notul. 3: pl. 159. 1851; W. Griff., Icon. Pl. Asiat. pl. 160. 1851; Ruhl. in Engl., Pflanzenreich 13 (4-30): 90, fig. 9. 1903; F. M. Bailey, Compreh. Cat. Queensl. Pl. 586, fig. 564. 1913; Fyson, Journ. Indian Bot. 2: pl. 1. 1921; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: pl. 7, fig. 5. 1955.

It should be noted here that the E. setaceum credited to "Auth."

or to "Auth. ex Ruhl.", to Hooker, and to Kunth are all synonyms of E. intermedium Körn.; the homonyms credited to "Auct. ex Backer & Bakh." and to Van Steenis are E. equisetoides Van Royen, the one credited to Bentham is E. bifistulosum Van Heurck & Muell.-Arg., the one accredited to Heyne is E. sexangulare L., that credited to Loureiro is Fimbristylis setacea Benth. in the Cyperaceae, those credited to Rottler and to Willdenow are E. cinereum R. Br., while E. setaceum Wight is a synonym of E. quinquangulare L. Hooker (1893) refers to "E. setaceum Wall., no. 6077" as a synonym of what he called E. capillus-naiadis, but Wallich (1832) in the reference referred to distinctly credits the binomial to Linnaeus and was not proposing a new homonym. Eriocaulon myriophyllum Wall. is apparently based on Gomez 10, collected in Tenasserim, Burma. Fischer (1931, 1956) regards E. intermedium Körn, as a synonym of E. setaceum, and so do Hooker (1893), Thwaites & Hooker (1864), and Thanikaimoni (1965). On the other hand, Hooker (1900) keeps E. capillus-naiadis as a distinct species and Haines (1924) regards it as a distinct form. Hooker (1913) regarded Australian material as E. bifistulosum Van Heurck & Muell.-Arg., but it seems far more probable that this Australian material is E. setaceum, as claimed by Bailey (1913).

Crantz gives no authority for the binomial used in his 1766 work, but cites Rheede's polynomial so that there is no doubt that he is referring to the same plant as did Linnaeus. It is worth noting that Crantz spells the generic name with a "v" on page 360 of his work, but with a "u" in volume 2, page [557], where no species are listed. The initial letter of the specific epithet is uppercased by Kunth (1841), his usual practice. He records the species from Tavoy, Ceylon, and Cochinchina. Under E. melanocephalum Kunth he notes "E. setaceo proximum; differt forma bractearum flores stipantium, sepalis interioribus femineis glabris et glanduliferis". The initial letter of Hooker's specific epithet is also sometimes uppercased.

Fyson (1921) records the plant as from "Assam: Khasia hills: Burma: Ceylon", and notes that "In some the female petals are ciliate and with distinct gland well inside the margin; in others they are glabrous with apical gland and distinct midrib". Lindley (1846) states that boiled in oil this plant is said to be a popular remedy for the itch in the "East Indies". Prain (1903) calls it "A submerged aquatic herb", and records it from north, central, and east Bengal. Collectors have found it mostly in swampy areas, at altitudes to 6000 feet, flowering and fruiting from August to November. Bhattacharyya (1963) found it "in Orissa, Mysore, West Coast; rare in Mirzanpur on the Upper Gangetic Plain where it is entangled with Spirogyra" and "rare in shaded pools by waterfalls, with Spirogyra". In his 1964 work he says "Uttar Pradesh; rare in stagnant pools associated with Spirogyra" and that it "grows in close vicinity with Blyxa auberti & Microcarpaea mucosa". Common names recorded are "borstenförmige Kugelbinse" (German) and "jon-

cinelle setacée" (French).

Lecomte (1912) distinguishes E. setaceum from the very similar E. intermedium Körn. as follows:

"Capitules glabres.....E. intermedium

Capitules blancs, velus.....E. setaceum"

Material has been misidentified and distributed in herbaria as E. intermedium Körn. On the other hand, the Wight 2369, distributed as E. setaceum, is in part E. intermedium Körn. and in part E. gracile Mart., while Herb. Wight 16 is E. quinquangulare L. The Berhaut 6502 cited by Berhaut (1967) is probably E. bifistulosum Van Heurck & Muell.-Arg. instead. The Herb. Griffith 5569 and Herb. Helfer 5569, cited below, were both distributed under the label of "Herbarium of the late East India Company No. 5569" in some herbaria.

Additional citations: PAKISTAN: East Bengal: Herb. Griffith 5569, in part (C, Mu—305). INDIA: Bombay: Santapau 11887 (Xa). Khasi States: Hooker & Thomson s.n. [hab. Mont. Khasia 6000 ped.] (Br, Mu—240, Ut—315). Mysore: Janaki Ammal 330 (Mi); Z. A. Khan s.n. [Agumbe, Sept. 1941] (Bn—3188); Meebold 9904 (B). BURMA: Tenasserim: Gomez 10 (Br); Herb. Griffith 5569, in part (C); T. Philippi 16 (B). ANDAMAN ISLANDS: Island undetermined: Herb. Griffith 5569, in part (C); Herb. Helfer 5569 (Mu—304). CEYLON: Thunberg s.n. [Zeilona] (Mu—239); Thwaites 791 (Br, Go). INDOCHINA: Cochinchina: Clemens & Clemens 4214 (N). THAILAND: Larsen, Smitinand, & Warncke 1666 (Ac, Rf); Sørensen, Larsen, & Hansen 2253 (Z), 6211 (Cp). AUSTRALIAN REGION: AUSTRALIA: Western Australia: Bradshaw & Allen s.n. [Woodhouse, 1891] (Mu—371).

ERIOCAULON SETICUSPE Ohwi

Synonymy: Eriocaulon echinulatum var. seticuspe Ohwi ex Moldenke, Résumé Suppl. 1: 17, in syn. 1959. Eriocaulon echinulatum var. seticuspe (Ohwi) Ohwi ex Koyama in Kitamura, Murata, & Koyama, Col. Illustr. Herb. Pl. Japan 3: 179. 1964.

Bibliography: Ohwi, Bull. Nat. Sci. Mus. Tokyo, new ser., 1 (1) [34]: 3. 1954; Koyama, Philip. Journ. Sci. 84: 369. 1955; Moldenke, Résumé 173 & 483. 1959; Moldenke, Résumé Suppl. 1: 17. 1959; Koyama in Kitamura, Murata, & Koyama, Col. Illustr. Herb. Pl. Japan 3: 179 & 429, fig. 121 (2). 1964; Moldenke, Résumé Suppl. 12: 9. 1965; G. Taylor, Ind. Kew. Suppl. 13: 52. 1966; Moldenke, Phytologia 18: 59. 1968.

Illustrations: Koyama in Kitamura, Murata, & Koyama, Col. Illustr. Herb. Pl. Japan 3: 179, fig. 121 (2). 1964.

Koyama (1955) points out that this species is obviously very closely related to E. echinulatum Mart.

Citations: WESTERN PACIFIC ISLANDS: JAPAN: Kyushu: Togasi 1415 (B, Ca—113864, G, N, S, Se—186602, Z), s.n. [Kawaminami-mura, Sept. 1, 1956] (Ac).

ERIOCAULON SEXANGULARE L.

Synonymy: Gramen junceum Ind. Orient. majus, capite rotundo, ex spiculis paleaceis, summo caule glomerato. Shaneecoree, Mala-barorum Pluk., Alm. Bot. Mant. 98. 1700. Kokmatha H. Herm., Mus. Zeyl., ed. 1, 7. 1717. Eriocaulon culmo sexangulari, foliis ensiformibus L., Fl. Zeyl., ed. 1, 20. 1747. Eriocaulon sexangulare Crantz, Inst. Rei Herb. 1: 360. 1766. Eriocaulon sexangulare L. apud Reich. in L., Syst. Pl. 1: 243. 1779. Eriocaulon quadrangulare Lour., Fl. Cochinch., ed. 1, 60—61. 1790. Eriocaulon wallichianum Mart. in Wall., Plant. Asiat. Rar. 3: 26, pl. 249. 1832. Gramen junceum Indiae Orientalis Pluk. apud Mart. in Wall., Plant. Asiat. Rar. 3: 28, in syn. 1832. Eriocaulon hexangulare L. ex Wall., Numer. List 207. 1832 [not E. hexangulare Kunth, 1893, nor Wall., 1937]. Eriocaulon setaceum Heyne ex Wall., Numer. List 207, in syn. 1832 [not E. setaceum Auct. ex Backer & Bakh., 1968, nor Auct. ex Ruhl., 1903, nor Benth., 1893, nor Crantz, 1766, nor L., 1753, nor Lour., 1790, nor Rottl., 1960, nor Wall., 1893, nor Wight, 1832]. Eriocaulon nitidum Blume ex Wall., Numer. List 207, in syn. 1832 [not E. nitidum Bong., 1831, nor Buch.-Ham., 1832]. Eriocaulon hexangulare Royle, Illustr. Bot. Himal. 409. 1840. Eriocaulon consanguineum Kunth, Enum. Pl. 3: 566. 1841. Eriocaulon cantoniensis Hook. & Arn., Bot. Beech. Voy. 219. 1841. Eriocaulon wallichianum Wight ex Kunth, Enum. Pl. 3: 566, in syn. 1841. Eriocaulon wallichianum f. gracilis Kunth, Enum. Pl. 3: 564. 1841. Eriocaulon sinicum Miq., Journ. Bot. Néerland. 1: 87. 1861. Eriocaulon wallichianum Schnitzl. apud C. Müll. in Walp., Ann. 6: 1171. 1861. Eriocaulon quidrangulare Lour. apud Hook. f., Fl. Brit. Ind. 6: 580, in syn. sphalm. 1893. Eriocaulon wallichianum Thw. ex Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 880. 1893. Eriocaulon cantoniense Hook. & Arn. apud Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 877. 1893. Eriocaulon sexangulare var. vulgaris Mak., Bot. Mag. Tokyo 8: 507. 1894. Eriocaulon sexangulare Ruhl. ex C. H. Wright, Journ. Linn. Soc. Lond. Bot. 36: 202, in syn. 1903. Eriocaulon longifolium Körn. ex C. H. Wright, Journ. Linn. Soc. Lond. Bot. 36: 201, in syn. 1903 [not E. longifolium Nees, 1841, nor "Nees ex Kunth", 1964, nor Raf., 1840]. Eriocaulon miyagianum Koidz., Bot. Mag. Tokyo 28: 171. 1914. Eriocaulon petrosepalum Hayata, Icon. Pl. Formos. 10: 55. 1921. Eriocaulon petropetalum Hayata, Icon. Pl. Formos. 10: 272. 1921. Eriocaulon sexangulare Miq. apud Hayata, Icon. Pl. Formos. 10: 272. 1921. Eriocaulon sexangulare var. vulgaris Körn. apud Hayata, Icon. Pl. Formos. 10: 272. 1921. Eriocaulon pterosepalum Hayata, Icon. Pl. Formos. 10: 54, fig. 30. 1921 [not E. pterosepalum Herzog, 1931]. Eriocaulon alpestore Sasaki, Cat. Govt. Herb. 118, in syn. sphalm. 1930. Eriocaulon alpestre Sasaki, Bull. Tokyo Sci. Mus. 4: [Rev.

Jap. Erioc.] 9, in syn. 1940 [not E. alpestre Hook. f. & Thoms., 1867, nor Ruhl., 1940]. Eriocaulon wallichianum var. tenellum Wight ex Moldenke, Known Geogr. Distrib. Erioc. 24 & 42, nom. nud. 1946. Eriocaulon wallichianum Heyne ex Moldenke, Known Geogr. Distrib. Erioc. 42, in syn. 1946. Eriocaulon petrospermum Hayata ex Moldenke, Known Geogr. Distrib. Erioc. 25 & 38, nom. nud. 1946. Eriocaulon pterospermum Hayata ex Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 133 & 206, nom. nud. 1949. Eriocaulon wallichiana Razi, Journ. Mysore Univ. 11 (1): 6, sphalm. 1950. Eriocaulon quadriangulare Lour. ex Moldenke, Phytologia 3: 397, in syn. 1950. Eriocaulon truncatum Harms ex Moldenke, Résumé 293, in syn. 1959 [not E. truncatum Buch.-Ham., 1893, nor "Buch.-Ham. ex Mart.", 1968, nor "Ham. ex Mart.", 1939, nor Mart., 1959, nor Wall., 1946]. Eriocaulon wallichianum var. angustifolium Meyen ex Moldenke, Résumé Suppl. 1: 18, in syn. 1959. Eriocaulon christophora Chandra ex Moldenke, Résumé Suppl. 11: 6, in syn. 1964. Eriocaulon sexangulare L. ex Moldenke, Résumé Suppl. 11: 6, in syn. 1964.

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ful Pl. Jap. 3: pl. 966. 1895; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1283. 1895; Hook. f. in Trimen, Handb. Fl. Ceylon 5: 2, 5, & 412. 1900; Ruhl. in Engl., Pflanzenreich 13 (4-30): 13, 21, 41, 103, 106, 110, 111, 116, 285, 287, & 288. 1903; C. H. Wright, Journ. Linn. Soc. Lond. Bot. 36: 201--202. 1903; H. Lecomte, Journ. de Bot. 21: 86, 87, 89, 94, 102, 104, 105, & 131. 1908; Hochr., Ann. Conserv. & Jard. Bot. Genève. 11/12: 51. 1908; H. Lecomte, Fl. Gén. Indo-Chine 7: 3 & 15. 1912; H. Lecomte, Not. Syst. 2: 215 & 393. 1913; Koidz., Bot. Mag. Tokyo 28: 171. 1914; H. Hallier, Beih. Bot. Centralbl. 34: 45. 1916; Fyson, Journ. Indian Bot. 2: 318, pl. 39 & 40. 1921; Prain, Ind. Kew. Suppl. 5, pr. 1, 97. 1921; Hayata, Icon. Pl. Formos. 10: 54--55 & 272, fig. 30. 1921; E. M. Merr., Bibl. Enum. Born. Pl. 110. 1921; Mak. & Nemoto, Fl. Jap., ed. 1, 1306 & 1307. 1925; S. Sasaki, List Pl. Formos. 99. 1928; A. W. Hill, Ind. Kew. Suppl. 7: 89. 1929; Stapf, Ind. Lond. 3: 90 & 91. 1930; S. Sasaki, Cat. Govern. Herb. 118. 1930; Mak. & Nemoto, Fl. Jap., ed. 2, 1512 & 1514. 1931; C. E. C. Fischer in Gamble, Fl. Presid. Madras 9: 1607 & 1618. 1931; Tu, Chinese Bot. Dict., abrdg. ed., 1347. 1933; Hand.-Mazz., Symb. Sin. 7: 1246. 1936; Nemoto, Suppl. Fl. Jap. 1039. 1936; Masamune, Short Fl. Formos. 263. 1936; Masamune, Trans. Nat. Hist. Soc. Formos. 28: 300. 1938; Honda, Nom. Pl. Jap. 462. 1939; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] 9--10, pl. 1, fig. 1. 1940; Satake in Nakai & Honda, Nov. Fl. Jap. 6: 6, 7, 11, 12, 18--20, 78, & 87, fig. 1N, 2F, 5D, & 7. 1940; Erlandsson, Arkiv Bot. 30B (2): 2--4, fig. 1e. 1942; Castell. in Descole, Gen. & Sp. Pl. Argent. 3: 77 & [103]. 1945; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 877--880 (1946) and 2: 1283. 1946; Moldenke, Known Geogr. Distrib. Erioc. 22--26, 33, 37--40, & 42. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 123, 125, 127, 129, 130, 132, 133, 135, 136, 138--142, 145, 205, & 206. 1949; Moldenke, Phytologia 3: 341 & 397--398. 1950; M. R. Henderson, Malay. Wild Fls. 212, fig. 127. 1954; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 174 & 175. 1955; Moldenke in Humbert, Fl. Madag. 36: 21--24, fig. 3 (1). 1955; Koyama, Journ. Jap. Bot. 31: 12 & 233--235. 1956; C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. 2, 8 [3]: 1120, 1126, & 1333. 1956; Moldenke, Résumé 156, 157, 159, 162, 165--167, 170, 172, 174, 176, 178, 180, 181, 184, 186, 192, 286--288, 290--294, 482, & 483. 1959; Van Royen, Nov. Guin., new ser., 10: 24, 25, & 44. 1959; Moldenke, Résumé Suppl. 1: 11 & 18. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 877--880 (1960) and 2: 1283. 1960; Prain, Ind. Kew. Suppl. 5, pr. 2, 97. 1960; Moldenke, Résumé Suppl. 3: 17, 18, 22--24, & 28 (1962), 5: 6 (1962), and 11: 6. 1964; Thanikaimoni, Pollen & Spores 7: 186. 1965; K. Larsen, Dansk Bot. Ark. 23: 378, 380, 381, & 397, fig. 15. 1966; Moldenke, Résumé Suppl. 17: 10 & 11. 1968; Ornduff, Reg. Veg. 55: 13 & 118. 1968; Moldenke, Phytologia 17: 10, 11, 383, 386, 387, 395, 454, 459, 461, & 488 (1968), 18: 53 (1968), 18: 81, 82, 106, 169, 172, 173, 180, 187, 243, 244, 274, 303, 309, 328, 352, 362, 379, 388, 425, 433, 434, 438, & 441 (1969), and 19: 12, 23, 25, 26, 38, & 44--46. 1969.

Illustrations: Mart. in Wall., Plant. Asiat. Rar. 3: pl. 249

[in color]. 1832; Schnitzl., Iconogr. 1: pl. 46. 1845; Useful Pl. Jap. 3: pl. 966 [in color]. 1895; Hayata, Icon. Pl. Formos. 10: 55, fig. 30. 1921; Fyson, Journ. Indian Bot. 2: pl. 39 & 40. 1921; Satake in Nakai & Honda, Nov. Fl. Jap. 6: 6, 7, 11, & 19, fig. 1N, 2F, 5D, & 7. 1940; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] pl. 1, fig. 1. 1940; Erlandsson, Arkiv Bot. 30B (2): 2, fig. 1e. 1942; M. R. Henderson, Malay. Wild Fls. fig. 127. 1954; Moldenke in Humbert, Fl. Madag. 36: [23], fig. 3 (1). 1955; K. Larsen, Dansk Bot. Ark. 23: 380, fig. 15. 1966.

Acaulescent perennial herb; rhizome simple, sometimes 2- or many-branched, densely clothed beneath with filiform roots, arachnoid between the leaves at its apex; leaves membranous, very narrowly linear or grass-like, 7.5-30 cm. long, 4-20 mm. wide, much surpassing the sheaths, usually nigrescent, narrowed to a rather acute apex, subpellucid or pellucid, very lightly fenestrate, 3-nerved or many-nerved, glabrous; sheaths rather loose, membranous, 6.5-9 cm. long, deeply split at the apex, glabrous or lightly pilose, the blade acuminate; peduncles many, filiform, 30-45 cm. long, 5- or 6-angled and -sulcate, usually twice as long as the leaves, stiff, finally twisted; heads hemispheric or subcylindric-globose, about 8 mm. wide, hard, rounded at the apex and convex at the base, finally conic and truncate at the base, usually conspicuously white-powdery; involucre bractlets subrotund-obovate, pale stramineous-flavitious, much shorter than the disk, convex, rounded at the base, shiny, pulverulent on the upper surface with very short rather thick white easily rubbed-off hairs, finally glabrate; receptacle glabrous; receptacular bractlets closely imbricate, broadly obovate or rhomboid-cuneate, pale-stramineous, acute and inflexed or cuspidate at the apex and there white-pulverulent on the outer surface; staminate florets: peripheral, pedicellate; sepals 3, connate to the apex, cuneate-obovate, flat, whitish, scarious-membranous, glabrous, truncate-rounded at the apex and there lightly and irregularly erose-dentate or emarginate-subbilobed, alate-margined, the wings narrow below; petals 3, included, pale-stramineous, forming an elongated tube that is flattened parallel to its axis, glabrous, with an irregularly 3-lobed limb, the lobes small, ovate-oblong, ciliate-barbate at the apex and there bearing a brown gland on the inner surface, the anterior lobe slightly larger; stamens 6, inserted at the top of the corolla-tube, the alternate ones longer, opposite the corolla-lobes and adnate to them; anthers didymous, elliptic, brown; pistil-rudiments in the center of the top of the corolla-tube, rather truncate, becoming brownish at the apex; pistillate florets: short-pedicellate; sepals 3, separate, pale brownish-stramineous, lateral, very broadly flattened-navicular, sublanceolate, convex beneath, membranous, hyaline, whitish, carinate-alate, obtuse at the apex, rather spongy, closing together in fruit, densely white-pilose toward the apex or glabrescent in age, the posterior one (the one away from the receptacular bractlet) shorter, the wing rounded and irregularly dentate above; petals 3, similar to the sepals and only very slightly shorter, hyaline, whitish, lanceolate, narrowed to the base, subulate-narrowed and ciliate at the

apex, non-glanduliferous, the anterior one (nearest the receptacular bractlet) slightly larger; ovary very short-stalked; style elongate; stigmas 3, simple; fruit very short-stalked, subdepressed-globose, hyaline, membranous, included by the persistent calyx, 3-seeded; seeds ovate-elliptic, acute at the end and where they are attached and rounded at the opposite end, or else finally rounded at both ends, bright brownish, hirtellous with 12--15 longitudinal lines of very minute subincrassate-truncate hyaline hair-like cellular outgrowths.

This very much misunderstood species occurs in Madagascar and Mauritius and from India and Ceylon through Burma, Indochina, and Malaya, northward to Hainan, Fukien, Kwangtung, and Formosa, and eastward to the Philippines, Pelew Islands, and Sabah. It has been collected at altitudes of 4 to 1200 meters, flowering and fruiting in January, April to August, October, and November, near water or in running water, swampy areas, ricefields, and rice-paddy margins. Vernacular names recorded for it are "aetch horac" (Madagascar), "fosi-kusa" and "kok moethe" (Philippines), "inunohige-modoki" and "oo-siratama-hosikusa" (Formosa), "ya hua ngawk" (Thailand), and "6winklichte Kugelbinse" (Germany). The initial letter of its specific epithet is uppercased by Kunth (1841), as are the initial letters of several of its synonyms by various authors.

Linnaeus (1747) places under his "Eriocaulon culmo sexangulari, foliis ensiformibus" the following synonyms:

Gramen junceum, chamaemeli capitulis aphyllis albis J. Burm., Thes. Zeyl. 108. 1737.

Gramen junceum indiae orientalis minus, capitulo rotundo ex paleaceis spiculis in cacumine caulis glomerato Pluk., Alm. Bot. Mant. 98. 1700.

These two names, however, seem better placed in the synonymy of E. quinquangulare L.

Fyson (1921) unites E. longifolium Nees with E. sexangulare and comments "On the western side of South India down to Ceylon, and throughout Burma and the Malay Peninsula. The plants of the Western peninsula are larger on the whole than those of the Eastern, which are frequently 2-merous. In the F. B. I. the latter is given as a variety and perhaps it should be so considered, but in every other respect the two forms are identical and it would always be necessary to dissect the heads to determine the point. The Mysore plants connect them. For this reason the separation of these forms as two distinct species, E. sexangulare L. & E. longifolium Nees, widely apart in different sections of the genus as is done by Ruhland seems particularly unhappy. Koerniche though he separated the American 2-merous species, placed these two together observing that the 2-merous flowers and acute not shortly acuminate floral bracts distinguish them." Erlandsson (1942) also regards the two as conspecific. Thwaites & Hooker (1864) regarded E. longifolium Nees as a synonym of what they called E. wallichianum Mart. and "E. thwaitesii Körn., in part"

as a synonym of E. sexangulare L. (the other part being E. truncatum Hamilt.). Satake (1940) regards E. miyagianum Koidz. as a valid species. Tu (1933) gives E. sieboldianum Steud. as a synonym of E. sexangulare, but this binomial certainly belongs in the synonymy of E. cinereum R. Br., as does also the E. tenue Hamilt. which Wallich (1832) lists as a synonym of his E. hexangulare.

It should be noted that the E. sexangulare L. described in detail by Kunth (1841) is for the most part actually E. cinereum R. Br., as are the E. setaceum Willd. and Leucocephala spathacea Roxb. which he lists as synonyms. The E. minimum Lam., which he also cites as a synonym, is probably distinct. He says of it "Lamarek hoc ducit cum ? Burm. t. 9. f. 4. et dubitat plantam suam eandem esse ac E. hexangulare Linn."

The E. nitidum Hamilt. and E. tenue Hamilt. which he also cites as synonyms (with the note "variat capitulis cinerascens, cinereo-nigricantibus") are also in the synonymy of E. cinereum R. Br. now.

Under the name, E. wallichianum, Kunth cites the species from Tavoy, China, and the Philippines, citing Meyen s.n., Philippi s. n., and Wallich 2364b ("forma gracilis") and 6068c ("juven."). His f. gracilis is described by him as "Folia 3-pollicaria, vix lineam lata; vaginae 3 -- 3 1/2-pollicares; pedunculi graciles, vix pedales; structura florum et seminum prorsus ut in forma communi".

He gives a long and detailed description of his so-called E. sexangulare, taken from Martius and from the Meyen Philippine collection, noting "Specimen alterum chinense a cel. Philippi acceptum humilius, folia 2 -- 2 1/4 pollicaria, pedunculi 3 1/2 -- 5 1/4 poll. longi. Specimina (Kleiniana?) in herb. reg. Berol. sub nomine Kok Moethe suppetentia cum supra descripto Meyeniano plane congruunt, exceptis notis subsequentibus: calyx exterior (ut in Eriocaulo consanguineo) apice rotundatus et emarginato-subbilobus; sepala feminea exteriora lateralia superne ad alam pilis brevissimis crassiusculis albis obsita, interiora (ut in Eriocaulo consanguineo) angustissime linearia, superne pilosa. Seminum structura prorsus eadem."

Under E. argenteum Mart. he says "Hinc E. quinquangulare, inde E. sexangulare affine atque ut videtur a nonnullis actoribus cum illis confusum, ratione doliorum ad scapos E. sexangulare propinquis, tomentosis capitulis E. quinquangulare; capitulorum magnitudine et scaporum firmitate utrumque, florum numero E. sexangulare separat." Under E. hamiltonianum Mart. he notes "E. sexangulare affine". In all these cases his concept of E. sexangulare is obviously the plant now known as E. cinereum R. Br.

It should be noted here that the type of E. wallichianum Mart. is W. Gomez 3 [Herb. Wallich 6068], of E. miyagianum Koidz. is T. Miyagi 364 in the herbarium of the University of Tokyo, and of E. sinicum Miq. is Krone s.n. in the herbarium of the University of

Utrecht; E. christophora Chandra is based on Chandra 49, E. longifolium Körn. is based on Thunberg s.n. from India, E. setaceum Heyne is based on Wallich 6073, E. truncatum Harms is based on Amano 6016 from Okinawa, and E. wallichianum var. angustifolium Meyen is based on Meyen s.n. from Cape Sing-moon, China.

The E. alpestre Hook. f. & Thoms., referred to in the synonymy above, is a valid species, while the homonym accredited to Ruhl-land belongs in the synonymy of E. robustius (Maxim.) Mak.; the E. hexangulare credited to Kunth and to Wallich are synonyms of E. cinereum R. Br.; E. longifolium Nees, as well as the variant accreditation, "Nees ex Kunth", belong in the synonymy of E. willdenovianum Moldenke, but the E. longifolium of Rafinesque is E. decangulare L.; E. nitidum Bong. is now known as Syngonanthus nitidus (Bong.) Ruhl., but E. nitidum Buch.-Ham. is E. cinereum R. Br.; E. setaceum L. is a valid species, with the homonyms accredited to Crantz and to Wallich as synonyms, while the homonym credited to "Auct. ex Backer & Bakh." is E. equisetoides Van Royen, that credited to "Auct. ex Ruhl." is E. intermedium Körn., that ascribed to Benthham is E. bifistulosum Van Heurck & Muell.-Arg., that credited to Loureiro is Fimbristylis setacea Benth. in the Cyperaceae, those credited to Rottler and to Willdenow are E. cinereum R. Br., and that accredited to Wight is E. quinquangulare L. The E. sexangulare Auct., as well as the homonym credited to "(L.) Auct." and to Martius, belong to E. cinereum R. Br., that of Burman is E. minimum Lam., that credited to Heyne is E. wightianum Mart., and those credited to Fyson and to Willdenow are E. willdenovianum Moldenke. The E. truncatum credited to "Buch.-Ham.", to "Ham. ex Mart.", to Martius, and to Wallich are all synonyms of E. truncatum Hamilt.

It should also be noted here that E. sexangulare var. longifolium Hook. f. belongs in the synonymy of E. willdenovianum Moldenke, while E. sexangulare var. α Körn., var. β Körn., and var. γ Körn. all appear to be E. cinereum R. Br. Müller (1860) apparently takes up these same Körnicke varieties (since he accredits them to Körnicke in his index on page 1171 of volume 2, 1861), distinguishing and typifying them as follows: "var. α -- foliis uninerviis": Hohenacker 131b & 133bb, König s.n., Rottler s.n., Thwaites 795, Wallich 6074 in part, and Wight 2366 in part; "var. β -- vulgaris, foliis trinerviis": E. sieboldiana Sieb. & Zucc., Cuming 670, Herb. Berol. s.n., Herb. Willdenow 2360, Macé s.n., Martius s.n., Siebold s.n., Wallich 6073a in part & 6073b in part, Wight 2366 in part, and Zollinger 92 & s.n.; "var. γ -- foliis latioribus, 5-7-nerviis (capitulis plerumque nigrescentibus pedunculis longioribus laxioribusque)": E. nitidum Hb. Hamilton and E. tenue Hb. Hamilton "(forma minor magis ad var. β spectans)" and Leucocephala spathacea Roxb. Fl. Ind. 3: 613, Hamilton s.n., Hornemann s.n., Martius s.n., Quartin-Dillon

s.n., and Wallich 6073a in part. Makino (1894) describes his "var. β vulgaris" also as "foliis trinerviis".

If the Hermann 14, in the herbarium of the Botanische Staatssammlung at Munich, from the Burman herbarium, is the actual type of Kockmotha zeylonensis J. Burm., as it seems that it may well be, then that name will have to be removed from the synonymy of E. quinquangulare L. and placed in that of E. sexangulare L. The specimen is inscribed "Kockmotha zeylonensis. Gramen junceum, Chamaemeli capitulis, aphyllis, albis. Herb."

The Erlandsson (1942) reference in the bibliography above is often cited as "1940", but the pages in question were actually not issued until February 25, 1942.

Wight 2858 and Falconer s.n. [Moulmain] are annotated "Eriocaulon sexangulare L. genuinum" by Schultes in the Munich herbarium. Of Ying 1525 Merrill says "This is exactly E. sinicum Miq. Krone! type Hb. Utrecht compared June 8, 1929". Schmid 81 in the Britton Herbarium at the New York Botanical Garden may represent a case of crossed labels with Schmid 81 cited by me in these notes under E. achiton Körn. Decary 10737 is anomalous in having very white heads, the bractlets not at all dark. H. Hallier 1172 is a mixture with E. truncatum Hamilt., while Hansen & Smitinand 12388b is a mixture with E. achiton Körn.

Dee found E. sexangulare "common along edge of rice fields" in Thailand, Bunnak found it "common in rice fields", Smitinand describes it as "common in swamps", a "common herb along edges of thickets in driedup swamps", and "close to ground in damp places in fields" in the same country, where Hansen & Smitinand aver that it is "common in wet localities". In Mauritius it was encountered "on marshy ground of the uplands", where Schlieben says it is "endemic". On Hainan island Tak found it to grow in small streams beside forests, and Lei says that it is "abundant on moist gentle slopes in sandy meadow soil". Walker & Tawada report it "submerged in pools; heads grayish-green, usually not submerged" on Iriomote island. Fosberg found it to be "locally common in grassy peat bog in broad ravine" on Ishigaki island. The flowering heads are usually described as white or dark-gray. Erlandsson (1942) and Larsen (1966) report the chromosome number as $2n = 36$.

Larsen (1966) refers to this as "A widely distributed species from Madagascar throughout tropical Asia to Polynesia". He continues: "The chromosome number was counted at $2n = 36$ in several good root tip metaphases; this corresponds well with the results of Erlandsson (1942). Also this author's drawings and his description of the chromosomes are in full agreement with the present findings on Thai material. The species is evidently a tetraploid with the basic number 9. The chromosomes are of the same type as those found in E. henryanum." Chung informs us that the plant is used in Chinese native medicine.

Merrill (1921) cites Gibbs 2596 from Sabah, while Satake (1940)

cites the following collections: FORMOSA: Faurie 176, Itô 84170, Kawakami & Sasaki s.n. [Nov. 1910], Odasima 13575, Suzuki 11765, Suzuki & Kohasigawa 4818. OKINAWAN ISLANDS: Iheyashima: Sakaguti s.n. [1924], Tamasiro s.n., Tawada s.n. Okinawa: Kanasiro 714, Miyagi 364, Sakaguti s.n. [1922]. SAKISHIMA ISLANDS: Iriomote: Doi 69, Itô 1465, Koidzumi s.n. [Jul. 1923], Sakaguti s.n. [1922]. Ishigaki: Kanasiro s.n. [Jul. 1911], Sakaguti s.n. [1922], Takamine 10 & 21. Hochreutiner (1908) cites Guillot 20 as *E. longifolium* Nees, but I have seen this collection number in the Paris herbarium and it is cited below as *E. sexangulare* L.

Material has been misidentified and distributed in herbaria under the names *E. longifolium* Nees, "*E. longifolium* var.", *E. pachypetalum* Hayata, *E. petrosepalum* Hayata, *E. shikokianum* Maxim., *E. truncatum* Hamilt., *E. 5-angulare* L., *Kyris indica* L., and *Kyris* sp.

On the other hand, the Griffith 5576, distributed as *E. sexangulare*, is actually *E. achiton* Körn.; C. B. Clarke 18851a is *E. alpestre* Hook. f. & Thoms.; Herb. Lingnan Univ. 16034, Kawakami 431, and Tak 535 are *E. buergerianum* Körn.; Bürger s.n. [In Japan], Griffith 5565 & 5579, Herb. Schreber s.n. [Selampur], Herb. Zuccarini s.n., Hohenacker 131b in part & 131bb, Hooker & Thomson s.n. [Chittagong, 0--1000 ped.], Hügel s.n. [India orientalis], Kollmann s.n. [Java], König s.n. [Tranguebar], Maximowicz s.n. [Yokohama, 1862], Poelt s.n. [27.10.1962], Polunin 381, Reinwardt s.n. [Java], Rottler 17, G. Thomson s.n. [Misor & Carnatic], and Wallich 6073a are *E. cinereum* R. Br.; Smitinand 3065a is *E. dianae* var. *longibracteatum* Fyson; S. K. Lau 4229 is *E. huianum* Ruhl.; Hosseus 102 is *E. luzulaefolium* Mart.; Elmer 6617 and *E. D. Merrill* 572 are *E. merrillii* Ruhl. (the latter being the type collection); Herb. Heyne 4 is *E. nilagirens* Steud.; Swamy s.n. [Bannerghatta, 25.11.62] is *E. oliveri* Fyson; Macrae 123 is *E. quinquangulare* L.; Hohenacker 131b (in part) and Stocks, Law & c. s.n. [Malabar, Concan & c.] are *E. redactum* Ruhl. (the latter being the type collection); Chang & En 2907 is *E. robustus* (Maxim.) Mak.; and Corner 37693 is the type collection of *E. sexangulare* f. *viviparum* Moldenke. Hohenacker 131bb, annotated by Miquel as "*Eriocaulon* affine *sexangulare* L." is, as stated above, *E. cinereum* R. Br.; Baum 111 is a mixture of *E. amboense* Schinz and *E. heudelotii* N. E. Br., while Hooker & Thomson s.n. [Silhet, Alt. O] and T. Thomson s.n. [Plan. Ganget. Sup.] are each a mixture of *E. cinereum* R. Br. and *E. truncatum* Hamilt.

Additional citations: MADAGASCAR: K. R. Afzelius s.n. [Tamatave, 26.7.1912] (S, S), s.n. [Moramanga, 12.10.1912] (S); Bernier 78 (P, P); Boivin s.n. [Ste. Marie] (P, P); Catat 2530 (P); Chapelier 80 (P), s.n. [Madagascar] (P); D'Alleizette 1162m (P); Decary 5721 (P), 6476 (P), 10029 (P), 10432 (P), 10737 (P); Geay

1865 (P), 7045 (P), 7046 (P), 7047 (P), 7165 (P), 7459 (P), 7460 (P), 7461 (P), 8050 (P), 9015 (P), 9030 (P), 9034 (P), 9035 (P), 9036 (P), 9037 (P), 9038 (P); Guillot 20 (P); Humbert 3404 (P); Lam & Meeuse 5572 (Le--939151-134, Vi); Loher s.n. [Tamatave, III.1911] (Mu--392); Perrier de la Bâthie 18238 (P, P); Perrottet 1820 (P); Petit-Thouars s.n. [Madag.] (P); Richard s.n. (P); Scott-Elliott 2271, in part (P); Viguier & Humbert 312 (P), 558 (P). MASCARENE ISLANDS: Mauritius: Bouton s.n. [Ile Maurice, 1830] (P, P); Richard s.n. [Ile de France] (P); Schlieben 10780 (Mu). INDIA: Bombay: J. Fernandez 1799 (Xa); S. N. Ramaswamy 6 (Rf); Sedgwick & Bell 5046 (N, Xa). Kerala: Janaki Ammal 491 (Mi, Mi); Meebold 12572 (S). Madras: Kuriakose s.n. [5-1-33] (N); "P. F. F." 5042 (S). Mysore: Chandra 49 (Bn--3165); E. K. Janaki 329 (Mi). Travancore: E. W. Erlanson 5092 (Mi); R. Wight 2858 (Mu--337, S). State undetermined: Barth s.n. [1858] (Br); Herb. Wight 1 (Br); König s.n. [India orientalis] (Br); Thunberg s.n. [1770] (S). CEYLON: Goebel s.n. [1898/9] (Mu); Herb. Mus. Berol. s.n. (B); Hermann 14 (Mu--261); Thwaites 220 (B, Br). BURMA: Tenasserim: C. B. Clarke 22 (Cp); Falconer s.n. [Moulmain] (Mu); W. Gomez 3 [Wallich 6068] (Br, N--photo, Z--photo); Wallich 6068c (Mu--325). CHINA: Fukien: H. H. Chung 2711 (Ca--243824), 3747 (Ca--288597), 3825 (Ca--288510); Metcalf & Ging 5073 (Ca--322277); L. Y. Tai 11617 (Ca--325788), 11618 (Ca--325787). Kwangsi: W. T. Tsang 22592 (S). Kwangtung: Herb. Mus. Berol. s.n. [Cap Lyny-moon] (B); Meyen s.n. [Cap Sing-moon] (B, B, B); W. T. Tsang 21110 (S); Ying 1525 (Ca--359962). Province undetermined: Andersson s.n. [China] (S); Krone s.n. [China austr.] (Ut--303); Meyen s.n. [China] (Br). CHINESE COASTAL ISLANDS: Hainan: W. Y. Chun 5797 (Ca); How & Chun 70286 (B); C. I. Lei 58 (Ca--611518, Mi); F. A. McClure s.n. [Herb. Canton Chr. Coll. 9827] (Bi); Tak 424 [Herb. Lingnan Univ. 17173] (Ca--356796); Tso 58 (B). HONGKONG: Collector undetermined s.n. [Happy Valley, 1865] (Ca--2421); Fortune 120 (S), s.n. (Mu--213); E. Oldenburg s.n. (S); Schattmüller 384 (B); Taam 1547 (Ca--56837); Tsui 282 (Ca--612349, E--1260592, Mi, V--3846, V--9134, W--1754581). THAILAND: Bunnak 136 [Herb. Roy. Forest Dept. 11522] (Ss); Dee 162 [Herb. Roy. Forest Dept. 3530] (Z); Hansen & Smitinand 11895 (Cp, Rf), 12388 (Rf), 12388b (Cp), 12418 (Cp, Rf); K. Larsen 10035 (Lw); Larsen, Smitinand, & Warncke 1661 (Ac, Rf); Seidenfaden 2458 (Cp), 2704 (Cp); Smitinand 266 [Herb. Roy. Forest Dept. 6250] (Ss), 2917 [Herb. Roy. Forest Dept. 12623] (Gg), 5432 [Herb. Roy. Forest Dept. 22018] (Gg); Sørensen, Larsen, & Hansen 135 (S), 783 (Cp), 7929 (Cp); Vesterdal 134 (Cp). INDO-CHINA: Annam: Clemens & Clemens 3301 (Ca--339571, Mi, N, Ut--79a); Schmid 81 (N), 1415 (N); Souchère 1411 (Cb), 1412 (N), 1416 (N); Squires 235 (Ca--306009). Laos: Petétot 8974 (N). Tonkin: Peté-

lot 5250 (N), 8093 (N). MALAYA: Johore: M. Jensen s.n. [Oct. 1901] (Cp). Singapore: Andersson s.n. [28 Jan. 1853] (S); Möller s.n. [9.1897] (S); H. N. Ridley s.n. [Singapore, 1892] (W—516149). MALAYAN ISLANDS: Langkawi: Corner 37982 (S). Palau Redang: M. Jensen s.n. [Oct. 1901] (Cp). WESTERN PACIFIC ISLANDS: RYUKYU ISLAND ARCHIPELAGO: OKINAWAN ISLANDS: Okinawa: Amano 6012 (W—2036157), 6016 (N, W—2036159); Walker & Tawada 6743 (W—2093992). SAKISHIMA ISLANDS: Iriomote: Gressitt 550 (S, Ut—16909a); Kawagoe s.n. [July 28, 1919] (Kg), s.n. [Aug. 19, 1919] (W—2071386); Walker & Tawada 6700 (N, N). Ishigaki: F. R. Fosberg 37135 (N), 37830 (N). FORMOSA: Collector undetermined s.n. [May 6, 1937] (Kg); Kawagoe s.n. [Aug. 2, 1914] (Kg); Odashima s.n. [Tanaka & Shimada 13575] (D—752408, Go, Mu, N, N); Simada 432 (Ca—344950); Suzuki 23 [Jul. 15, 1935] (N, W—2062478, W—2062479), s.n. (Kg). PHILIPPINE ISLANDS: Island undetermined: Cuming 2328 (Mu—345). PALAU ISLANDS: Yap: Hosokawa 8820 (Bi), 8858 (Mi). INDONESIA: GREATER SUNDA ISLANDS: Borneo: H. Hallier 1172, in part (Ca—227870, Ca—265588). Sumatra: H. S. Yates 2486 (Ca—318476). CULTIVATED: Java: Slooten s.n. [Buitenzorg, 1937] (S). LOCALITY OF COLLECTION UNDETERMINED: Herb. Dahl 21 (S); Herb. Gasstrom s. n. (S); Herb. Osbeck 53 (S).

ERIOCAULON SEXANGULARE f. VIVIPARUM Moldenke

Bibliography: Moldenke, Résumé Suppl. 5: 6. 1962; Moldenke, Phytologia 8: 388. 1962; Hocking, Excerpt. Bot. A.6: 455. 1963; Moldenke, Biol. Abstr. 42: 1517. 1963.

Citations: MALAYA: Johore: Corner 37693 (S—type).

ERIOCAULON SIAMENSE Moldenke

Bibliography: Moldenke, Phytologia 5: 83—84. 1954; Moldenke, Résumé 178 & 483. 1959; G. Taylor, Ind. Kew. Suppl. 12: 55. 1959; Moldenke, Phytologia 18: 360. 1969.

Smitinand describes this plant as an herb with "purple radical leaves, white flowers, common on rocky ground in open pine forests", at 1300 meters altitude, flowering in October. The Smitinand 416 [Herb. Roy. Forest Dept. 5113], distributed as E. siamense, is actually E. odoratum Dalz.

Citations: THAILAND: Native Collector 18 (S—type, Z—isotype); Smitinand 2050 [Herb. Roy. Forest Dept. 11528] (Z); Sørensen, Larsen, & Hansen 6162 (Cp).

ERIOCAULON SIGMOIDEUM C. Wright

Bibliography: Sauv., Anal. Acad. Ci. Habana 8: 48. 1871; Ruhl. in Engl., Pflanzenreich 13 (4-30): 32, 36, & 287. 1903; Prain, Ind. Kew. Suppl. 4, pr. 1, 82. 1913; Moldenke, N. Am. Fl. 19 (1): 19 & 29. 1937; Prain, Ind. Kew. Suppl. 4, pr. 2, 82. 1938; Moldenke, Phytologia 1: 327. 1939; León, Fl. Cuba 1: 280. 1946; Moldenke, Known Geogr. Distrib. Erioc. 4 & 40. 1946; Moldenke, Known

Geogr. Distrib. Verbenac., [ed. 2], 44 & 206. 1949; Moldenke, Résumé 52, 53, & 483. 1959.

The Britton, Britton, & Wilson 14948, distributed as E. sigmoideum, is actually E. sclerocephalum Ruhl.

Additional citations: CUBA: Pinar del Río: C. Wright 3737 (S-isotype). ISLA DE PINOS: Ekman 12106 (S); Killip 44567 (Z).

ERIOCAULON SIKOKIANUM Maxim.

Synonymy: Eriocaulon sikokianum Körn. ex Moldenke, Résumé 292, in syn. 1959 [not E. sikokianum Miyabe & Kudo, 1940]. Eriocaulon shikokianum Maxim. ex Moldenke, Résumé Suppl. 1: 18, in syn. 1959.

Bibliography: Mak., Bot. Mag. Tokyo 4: 174. 1890; Maxim., Diagn. Pl. Nov. Asiat. 8: 7 & 16--17. 1893; Mak., Bot. Mag. Tokyo 8: 506. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 158 & 501. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 12, 65, 92, & 287. 1903; Matsumura, Ind. Pl. Jap. 2 (1): 177. 1905; Mori, Enum. Pl. Corea 80. 1922; Mak. & Nemoto, Fl. Jap., ed. 1, 1307. 1925; Ruhl., Notizbl. Bot. Gart. Berlin 10: 1043. 1930; Mak. & Nemoto, Fl. Jap., ed. 2, 1515. 1931; Tu, Chinese Bot. Dict., abrdg. ed., 297. 1933; Nemoto, Suppl. Fl. Jap. 1040. 1936; Hand.-Mazz., Symb. Sin. 7: 1246. 1936; Honda, Nom. Pl. Jap. 463. 1939; Satake in Nakai & Honda, Nov. Fl. Jap. 6: 1, 6, 7, 13, 42, 49, 56, 80, & 87, fig. 1K, 2H, & 26. 1940; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] 44--46. 1940; Mak., Illustr. Fl. Jap. 772 & E.26, fig. 2315. 1940; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 2, 158 & 501. 1941; Moldenke, Known Geogr. Distrib. Erioc. 25 & 40. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 133, 134, & 206. 1949; Moldenke, Phytologia 3: 398. 1950; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 158 & 501. 1959; Moldenke, Résumé 171, 173, 292, & 483. 1959; Moldenke, Résumé Suppl. 1: 18 (1959) and 3: 18. 1962; Koyama in Kitamura, Murata, & Koyama, Col. Illustr. Herb. Pl. Japan 3: 180--182 & 430, fig. 123 (6). 1964; Moldenke, Résumé Suppl. 12: 8--10. 1965; Moldenke, Phytologia 18: 181, 182, 271, 311, 355, & 392. 1969.

Illustrations: Mak., Illustr. Fl. Jap. fig. 2315. 1940; Satake in Nakai & Honda, Nov. Fl. Jap. 6: 6, 7, & 56, fig. 1K, 2H, & 26. 1940; Koyama in Kitamura, Murata, & Koyama, Col. Illustr. Herb. Pl. Japan 3: 180, fig. 123 (6). 1964.

It is worth noting here that the original description by Maximowicz (1893) is variously cited by other authors, sometimes as "Dec. Pl. Asiat. 8, 16. 1892" or "Bull. Acad. Sc. Pétersb. 12". Durand & Jackson (1902) cite it to page "10" in error, but later correct this. A letter from the librarian at the Royal Botanic Gardens at Kew has brought me a photocopy of what purports to be Maximowicz's "Diagnoses plantarum novarum asiaticarum. VIII" and which the Kew librarian indicates is a reprint from "Bulletin de l'Académie Impériale des Sciences de St.-Pétersbourg. Tome XIII" published "21 Octobre / 2 Novembre 1892". According to Merrill & Walker, however, this portion of Maximowicz's series was never actually published in the Bulletin and was published only separately in 1893.

The E. sikokianum accredited to Miyabe & Kudo is a synonym of E. hondoense Satake, while E. sikokianum var. lutchuense Satake and E. sikokianum var. lutschuense (Koidz.) Satake are E. lutchuense Koidz.

Eriocaulon sikokianum has been found growing at altitudes of 1000 to 1200 meters, flowering and fruiting from August to December. Ohwi & Koyama found it growing "in swamp peat area of moor with Carex, Parnassia, Epipactis, and Iris" and note that it is "very near to E. miquelianum and differing from it only by shorter involucral scales and glabrous receptacle". Common names recorded for it are "oo-inunohige" and "siro-inunohige".

The Furuse s.n. [3 October 1952] and Togasi 722, distributed as E. sikokianum, are actually E. hondoense Satake, while Furuse s.n. [27 Sept. 1955] is E. miquelianum Körn., Kawagoe s.n. [Sept. 30, 1906] is E. nipponicum Maxim., Amano 6012 is E. sexangulare L., and Ichikawa 200846 is E. truncatum Hamilt.

Satake (1940) cites the following collections: KOREA: Faurie 1428; Nakai 6005. JAPAN: Honshu: Collector undetermined 17150; Hasimoto s.n. [Oct. 1930] & s.n. [Nov. 1932]; Itô s.n. [Oct. 1893]; Koidzumi 13404; Kotô 58813; Matusima 37352; Matuyama s.n. [Oct. 1936]; Nakamura 51289; Nikai 2962; Oda 2596; Sakaguti 13 & 15; Tamaki 36; Tuboi s.n. [Oct. 1931]; Turumati s.n. [Sept. 1931]; Ui 23; Yosino s.n. [Sept. 1915] & s.n. [Oct. 1915]. Kyushu: Collector undetermined 29997; Doi 59; Mayebara 3661 & H.360; Nabesima s.n. [Yunaso-mura]; Nakasima 42, 43, & 44; Sugino s.n. [Oct. 1927]; Tasiro 29998, s.n. [Jul. 1913], s.n. [Oct. 1918], & s.n. [1921]; Tiba s.n. [Oct. 1934]. Sikoku: Collector undetermined 32723; Nikai 2375; Ogata s.n. [Dec. 1923]; Oti 3.

Additional citations: WESTERN PACIFIC ISLANDS: JAPAN: Honshu: Murata 18989 (Ac); Ohwi & Koyama s.n. [17 October 1954] (Z); Omu-ma s.n. [Nikko, 16/8/84] (B). Kyushu: Ichikawa 200846-65 (Mg), 200846-115 (Mg).

ERIOCAULON SIKOKIANUM var. MATSUMURAE (Nakai) Satake

Synonymy: Eriocaulon matsumurae Nakai, Bot. Mag. Tokyo 24: 5. 1910.

Bibliography: Nakai, Bot. Mag. Tokyo 24: 5. 1910; Prain, Ind. Kew. Suppl. 4, pr. 1, 82. 1913; Mak. & Nemoto, Fl. Jap., ed. 1, 1305 (1925) and ed. 2, 1512. 1931; Nemoto, Suppl. Fl. Jap. 1039. 1936; Satake, Bot. Mag. Tokyo 51: 287 [Shib. Comm. Art. 17: 105]. 1937; Prain, Ind. Kew. Suppl. 4, pr. 2, 82. 1938; Honda, Nom. Pl. Jap. 462. 1939; Satake in Nakai & Honda, Nov. Fl. Jap. 6: 13, 41, 79, & 87. 1940; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] 29-30, pl. 5, fig. 9. 1940; Moldenke, Known Geogr. Distrib. Erioc. 25 & 37. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 134 & 205. 1949; Moldenke, Résumé 173 & 481. 1959; Moldenke, Résumé Suppl. 3: 18. 1962; Koyama in Kitamura, Murata, & Koyama, Col. Illustr. Herb. Pl. Japan 3: 182, 429, & 430. 1964.

NEW TREE SPECIES FROM ESMERALDAS, ECUADOR
(CONTINUED)

ELBERT L. LITTLE, JR.

Four new tree species from the Province of Esmeraldas in northwestern Ecuador are published here in the following genera (and families): *Wettinia* Poepp. ex Endl. (Palmae), *Virola* Aubl. (Myristicaceae), 2, and *Clusia* L. (Guttiferae). Also, a new combination is made in *Inga* Mill. (Leguminosae).

This article is a continuation of articles with the same title (Phytologia 18: 195-208, 404-418, 457-472, illus. 1969), the fourth in a series. Each description is accompanied by a line drawing prepared for a book on the common trees of Esmeraldas, now in press. The work was done under the forestry project, Desarrollo Forestal de Noroccidente (DEFORNO). This was United Nations Special Fund Project No. 127, administered by the Food and Agriculture Organization (FAO) of the United Nations and the Government of Ecuador.

WETTINIA UTILIS Little, sp. nov. "Gualte." Fig. 17.

Arbor vel palma parva sempervirens ad 10-15 m. alta, trunco gracili 10-20 cm. diametro, griseo, laevi, annulato. Radices sustinentes multae 0.5-1 m. altae, 3-5 cm. diametro, brunneae spinis multis brevibus. Folia vel frondes minimum 6, alterna patentia pinnata, 3-5 m. longa. Petiolus brevis vagina tubulari minimum 1 m. longa, albido-virens. Rhachis crassa, 3-5 m. longa, brunnea, puberula, supra carinata, subtus complanata. Foliola vel segmenta multa, subopposita, cernua, linearia, fere 1 m. longa et 10 cm. lata, coriacea, basi angustata et plicata, apice acuminata, margine parum sinuata, supra impolito-viridia nervis 10-15 parallelis impressis, subtus impolito-virescentia subtiliter brunco-puberula nervis prominentibus.

Inflorescentia infrafoliariae plures unisexuales erectae, spathis fusiformibus 20-34 cm. longis, 6-9 cm. latis, apice acutis, virescentibus vel griseis, puberulis, lignosis, sutura 1. Inflorescentiae masculae spathis lignosis 3, spadice ramulis 4 longis. Flores masculis aggregati sessiles 1 cm. longi, albi, sepalis 3 linearibus 2 mm. longis, 3-4 petalis lanceolatis 5-7 mm. longis, 8-11 staminibus 7-8 mm. longis filamentibus brevibus 1 mm. longis. Inflorescentiae femineae spadice ramulis 3 vel 4. Flores feminei 1 cm. longi, 3 sepalis, 3 petalis et pistillo stylo basale stigmatibus 3 longis.

Spadix fructifer cernuus, pedunculo crasso complanato 20 cm. longo fructibus aggregatis cylindricis 3 vel 4, 20-30 cm. longis, 8 cm. diametro. Fructi multi arctissime conferti, obovoidei vel obpyramidales, 2.5-3 cm. longi, 1.5-2 cm. lati, ob pressione 4-6-angulati, apice convexi, puberuli, sepalis, petalis styloque persistentibus. Semen ellipsoideum 1.5-2 cm. longum.

Small evergreen tree or palm 10-15 m. high, with slender trunk 10-20 cm. in diameter, gray, smooth, with rings. Prop roots many, 0.5-1 m. high and 3-5 cm. in diameter, brown, with many short spines. Bud very narrow, linear, formed by a young folded leaf. Leaves or fronds 6 or more, alternate, spreading, pinnate, 3-5 m. long. Petiole short with tubular sheath 1 m. long or more, whitish green. Rachis stout, 3-5 m. long, brown, puberulent, keeled above, flattened beneath. Leaflets or segments many, almost opposite, drooping, linear, nearly 1 m. long and 10 cm. wide, coriaceous, narrowed and folded at base, acuminate at apex, slightly wavy at margin, above dull green with 10-15 parallel impressed nerves, and beneath dull light green, finely brown-hairy, with prominent nerves.

Inflorescences below the leaves, several, unisexual, erect, with fusiform spathes 20-34 cm. long and 6-9 cm. wide, acute at apex, whitish green or gray, puberulent, woody, splitting open on 1 side. Male inflorescences with 3 woody spathes, spadix with 4 long branches. Male flowers many, crowded, sessile, 1 cm. long, white, composed of 3 linear sepals 2 mm. long, 3-4 lanceolate petals 5-7 mm. long, 8-11 stamens 7-8 mm. long with short filaments 1 mm. long. Female inflorescences with spadix with 3 or 4 branches. Female flowers 1 cm. long, composed of 3 sepals, 3 petals, and pistil with basal style and 3 long stigmas.

Fruiting spadix drooping, with stout flattened peduncle 20 cm. long and 3 or 4 cylindrical aggregate fruits 20-30 cm. long and 8 cm. in diameter. Fruits many, very crowded, obovoid or obpyramid-shaped, 2.5-3 cm. long, 1.5-2 cm. wide, 4-6-angled from pressure, convex at apex, puberulent, with sepals, petals, and style persistent. Seed ellipsoid, 1.5-2 cm. long. Collected with flowers and fruits in September.

Trunk in cross section with hard outer layer 3 cm. thick and large black vascular bundles scattered in orange-streaked soft pith.

Gualte is important for a special use of it slender smooth trunks, which are strong and durable. They make excellent telegraph poles and were used for that purpose along the narrow-gauge railroad connecting San Lorenzo on the Pacific Coast with the Sierra. Elsewhere they should serve similar uses for poles.

ECUADOR, ESMERALDAS: Alto Tambo, alt. 650 m., lower montane forest. Sept. 22, 1965, E. L. Little, Jr., and R. G. Dixon 21114 (HOLOTYPE, US; isotype, BH).

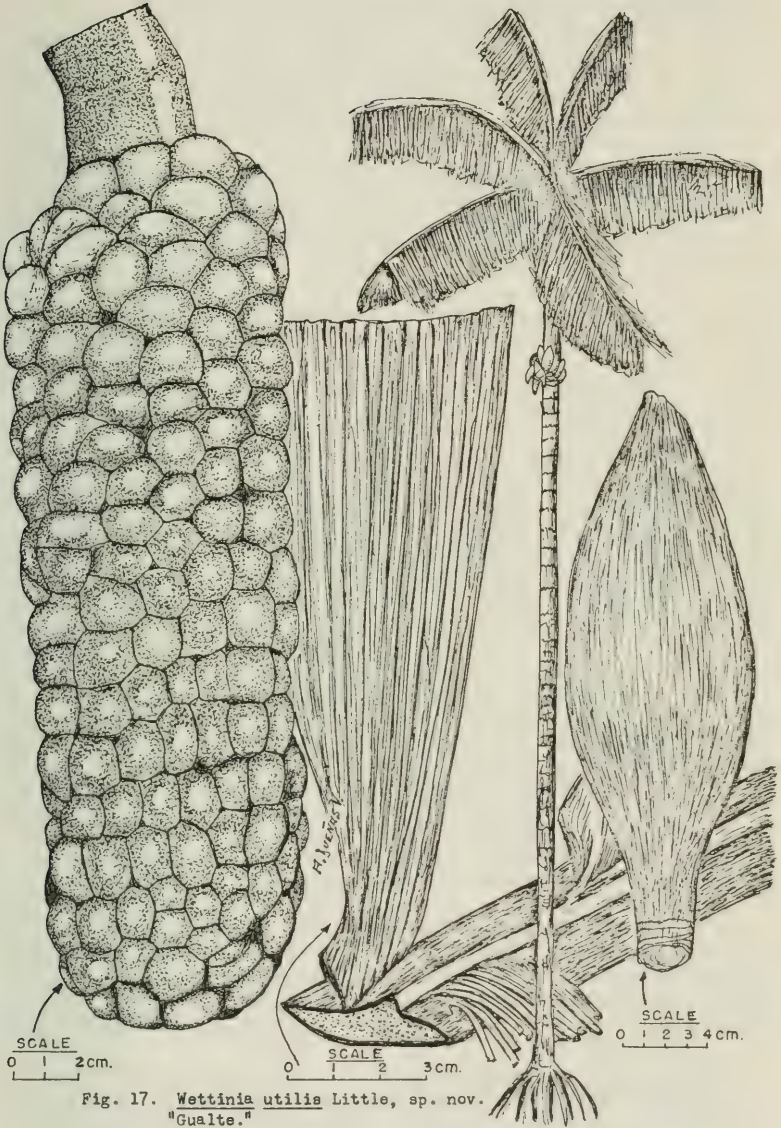


Fig. 17. *Wettinia utilis* Little, sp. nov.
"Gualte."

This palm is common in the lower montane forest of Esmeraldas. The type was collected at Alto Tambo, a small station along the railroad and the location of a forest survey line. Gualte was observed also near Quinindé.

Fig. 17 illustrates a mature palm, also, from left to right a branch or an aggregate fruit of the fruiting spadix, a portion of the rachis with base of segments, and a spathe.

The palm genus Wettinia Poepp. ex Endl. contains 6 species, including this one. There are 3 in Peru (J. Francis Macbride, Fl. Peru 1: 360-362. 1960). Of those, W. maynensis Spruce is recorded also from eastern Ecuador. Two others are in Colombia (Armando Dugand, Caldasia 1: 37. 1940).

Wettinia utilis is related to W. quinaria (Cook & Doyle) Burret, of the Pacific slope of western Colombia. O. F. Cook and C. B. Doyle (Contrib. U. S. Natl. Herbarium 16: 235-237. 1913) recorded the common name "gualte" for that species. Incidentally, the original publication (as Wettinella quinaria Cook & Doyle) contained an error in the photographs only partly corrected afterwards. The 2 photographs in fig. 54, each of a palm leaf and fruits, have the leaves reversed. Fig. 54B labeled Wettinella quinaria shows the characteristic fruit stalk bearing 4 large masses of fruits. However, the accompanying leaf belongs to fig. 54A, labeled Acrostigma equale Cook & Doyle, and the leaf under the latter name should be with fig. 54B. Wettinia quinaria has large aggregate fruits to 39 cm. long and with long hairs.

One of the conspicuous plant families of trees in the wet tropical forests of Esmeraldas after Lauraceae and Moraceae, is Myristicaceae. The trees are common, and the light-weight soft woods are commercially important. A new species was described in a previous article, Osteophloem sulcatum Little (Phytologia 18: 404, fig. 6. 1969), "chalviande (frutos surcados)" or "chalviande colorado." Dialyanthera, common name "cuángare," is represented by D. gordoniiifolia (Warb.) A. DC., D. gracilipes A. C. Smith, and a third species, "cuángare blanco."

The tropical American genus Virola Aubl. contains about 50 species ranging from Guatemala and the Lesser Antilles south to southern Brazil, Bolivia, and Peru. The species are most numerous in the Amazon basin. Thirty-eight species were accepted in the monograph by A. C. Smith (The American species of Myristicaceae. Brittonia 2: 393-510, illus. 1937).

Virola, common name "chalviande," has at least 4 species in Esmeraldas. Besides V. sebifera Aubl., which is widespread in tropical America, 2 new species are described here. A sterile specimen of another species was collected also.

With the U. S. Forest Service forest survey in 1943, I collected specimens of these 2 new species of *Virola*, cited by genus in the report (Caribbean Forester 9: 234-235. 1948). The specimens were annotated by A. C. Smith as probably new but too poor for description. Additional material was collected in 1965. In the interval both were found also in southwestern Colombia.

In 1943, Santo Domingo de los Colorados, Province of Pichincha, was an outpost at the end of the road west of Quito and surrounded by wet tropical forest. Returning in 1965, I found a growing city. The trail northwest in the Province of Esmeraldas to Quinindé, earlier 4 days by pack trip, had become a paved highway. The forests had been replaced by banana plantations. Near Santo Domingo de los Colorados one small patch of forest was located, but it was being cleared. Represented among the fallen trees were the 2 species of *Virola* and the new species of *Clusia* described below.

VIROLA DIXONII Little, sp. nov. "Chalviande (peludo)," "chalviande." Fig. 18.

Arbor magna sempervirens ad 35 m. alta, trunco 50-75 cm. diametro, anteridibus altis angustis ad 2 m. altis latisque. Cortex asper, subtiliter fissuratus, griseus; cortex interior roseus demum aurantiacus ubi expositus, condimenti sapore amaro, succo rubello amaro. Ramuli fere horizontales non ramosi, longi, pubescentes, flavo-virides. Ramuli, petioli, foliorum paginae infernae, atque flores dense stellato-pilosi pilis cinnamomei vel ferruginei. Gemmae nudae folii juvenis plicati ferrugineo-pilosi formatae. Folia alterna biserialia, petiolis crassis curvis 0.5-1 cm. longis, longitudinaliter sulcatis, virescentibus vel brunneis. Laminae anguste oblongae, 13-25 cm. longae, 3.5-6 cm. latae, parum coriaceae, apice acuminatae, basi acutae, margine plus minusve revolutae, nervis lateralibus 25-40 utrinque rectis parallelis impressis sub angulo fere 90° abeuntibus, supra atrovirentes nitidae glabratae, subtus flavo-virides puberulae nervis prominentibus.

Dioecia. Paniculae axillares 3-6 cm. longae, multis floribus puberulis 2-3 mm. longis latisque, pedicellis tenuibus puberulis 1-2 mm. longis extensis. Flores masculini plures fasciculati ramulis crassis puberulis, calyce plus quam dimidio ad basin trilobato, androecio filamentibus tenuibus 1 mm. longis et antheris connatis 0.5 mm. longis composito. Flores feminei calyce plus quam dimidio ad basin trilobato, ovario globoso puberulo 2 mm. longo, stigmate bilobo.

Fructi drupae dehiscentes 1-5 pedunculo crasso 2-4 cm. longo, ellipsoideae vel subglobosae 4 cm. longae, 3-3.5 cm. diametro (in vivo), griseo-virides demum brunneae, pericarpio crasso, bivalves, aromaticae. Semen ellipsoideum 3 cm. longum, 2.3 cm. diametro, arillo laciniato rubro ad dimidium obtectum.

Large evergreen tree to 35 m. high, with trunk 50-75 cm. in diameter, with high narrow buttresses to 2 m. high and wide. Bark rough, finely fissured, gray; inner bark pink, turning orange when exposed, with bitter taste of spice, and with bitter reddish sap. Twigs nearly horizontal, unbranched, long, hairy, yellow green. Twigs, petioles, lower surface of leaves, and flowers densely stellate-pilose with cinnamon or rust-colored hairs. Buds naked, formed from a folded rusty hairy young leaf. Leaves alternate in 2 rows, with stout curved petioles 0.5-1 cm. long, longitudinally grooved, light green or brown. Blades narrowly oblong, 13-25 cm. long, 3.5-6 cm. wide, slightly coriaceous, acuminate at apex, acute at base, slightly revolute at margin, with 25-40 straight parallel impressed lateral nerves on each side at angle almost 90° , above shiny dark green and glabrate, beneath yellow green, puberulent with prominent nerves.

Diocious. Panicles axillary, 3-6 cm. long, with many puberulent flowers 2-3 mm. long and broad, on slender puberulent pedicels 1-2 mm. long. Staminate flowers several fasciculate on stout puberulent branches, with calyx 3-lobed more than half to base and androecium of slender filament 1 mm. long and connate anthers 0.5 mm. long. Pistillate flowers puberulent with orange-colored calyx 3-lobed more than half to base, rounded puberulent ovary 2 mm. long and 2-lobed stigma.

Fruits dehiscent drupes 1-5 on stout peduncle 2-4 cm. long, ellipsoid or subglobose, 4 cm. long, 3-3.5 cm. in diameter (fresh), gray green, afterwards brown, thick-walled, 2-valved, aromatic. Seed ellipsoid, 3 cm. long, 2.3 cm. in diameter, half covered by lacinate red aril. Perhaps flowering and fruiting irregularly through the year.

The sapwood is whitish or cream-colored, and the heartwood pink. The soft, light-weight wood is used for general light construction and plywood.

ECUADOR, ESMERALDAS: San Lorenzo, alt. 30 ft., wet tropical forest, Apr. 20, 1943, E. L. Little, Jr. 6300 (immature fruit; US); same locality, Apr. 21, 1943, E. L. Little, Jr. 6315 (US); Borbón, alt. 10 m., wet forest, Sept. 10, 1965, E. L. Little, Jr. and R. G. Dixon 21032 (fruit; US, NY; wood sample, MADw); San Antonio, 20 km. S. of Borbón on Río Cayapas, alt. 60 m., wet forest, Sept. 18, 1965, E. L. Little, Jr., and R. G. Dixon 21088 (♀, fruit; US, NY) and 21092 (♂; HOLOTYPE, US; isotype, NY); Estero Capulí, Río Pambil, alt. 20 m., July 4, 1966, C. Játiva 295 (1063; ♀; US, LA).

COLOMBIA, NARIÑO: Costa del Pacífico, Río Chagüí, Quebrada Alojál, Mar. 15, 1955, "chalviande," F. B. Lamb 190 (♀, US).



Fig. 18. *Virola dixonii* Little, sp. nov. "Chalviande (peludo)."

This species is known from the Pacific Coast of northwestern Ecuador, also Narino in southwestern Colombia. It is very common in the wet tropical forest at low altitudes in Esmeraldas. Also, as noted above, it was observed south to Santo Domingo de los Colorados, Province of Pichincha.

Fig. 18 illustrates a portion of a fruiting twig, also at right a pistillate inflorescence (E. L. Little, Jr., and R. G. Dixon 21088).

Robert G. Dixon, Australian silviculturist with the forestry assisted in collecting the type and other specimens, also a wood sample for testing.

VIOLA REIDII Little, sp. nov. "Chalviande (lampiño),"
"chalviande." Fig. 19.

Arbor magna sempervirens ad 40 m. alta, trunco 60 cm. diametro, anteridibus altis angustis ad 2 m. altis. Cortex subtiliter fissuratus vel fere laevis, interdum lenticellis verrucosis, griseo-roseus vel brunneus; cortex interior roseo et rubello-vittatus, insipidus, succo rubello amaro. Ramuli fere horizontales facie glabrata vero minute stellato-pilosi, virescentibus. Gemmae nudae folii juvenis plicati pubescentis compositae, cinna-momeae vel flavo-virides. Folia alterna biserialia, petiolis crassis 0.5-1 cm. longis, longitudinaliter sulcatis, virescentibus. Laminae anguste oblongae vel oblanceolatae, 10-23 cm. longae, 3-6.5 cm. latae, papyraceae vel parum coriaceae, glabrae, apice acutae, basi acutae vel rotundatae, margine revolutae, nervis lateralibus 25-35 vel pluribus rectis parallelis utrinque sub angulo fere 90° abeuntibus, supra atrovirentes plus minusve nitidae vel opacae, subtus albidovirentes nervis flavidis prominentibus.

Dioecia. Paniculae axillares 3-7 cm. longae, multis floribus puberulis ramulis crassis puberulis. Flores masculini plures fasciculati pedicellis tenuibus puberulis 2 mm. longis, 2 mm. longi, calyce flavido plusquam dimidio ad basin trilobata, androecio filamentibus tenuibus 0.5-1 mm. longis et antherarum connatis 9.5 mm. longis composita. Flores feminei pauci pedicellis tenuibus puberulis 3 mm. longis, 2-3 mm. longis, calyce brunneo plus quam dimidio ad basin trilobato, ovario globoso puberulo 1 mm. longo stigmatibus bilobis.

Fructi drupae dehiscentes 1-2 pedunculo crasso 3-4 cm. longo, ellipsoideae 3 mm. longae, 2.5 cm. diametro (in vivo), virides demum atro-brunneae, pericarpio crasso, bivalves, aromaticae. Semen ellipsoideum 22-25 mm. longum, 14-17 mm. diametro, arillo laciniato rubro fere obtectum.



Fig. 19. *Virola reidii* Little, sp. nov.
"Chalviande (lampiño)."

Large evergreen tree to 40 m. high and 60 cm. in trunk diameter, with high narrow buttresses to 2 m. high. Bark finely fissured or nearly smooth, sometimes with warty lenticels, pink gray or brown; inner bark pink and reddish streaked, tasteless, with bitter reddish sap. Twigs nearly horizontal, long, appearing glabrate but with minute stellate hairs, light green. Buds naked, formed from a folded hairy young leaf, cinnamon-colored or yellow green. Leaves alternate in 2 rows, with stout petioles 0.5-1 cm. long, longitudinally grooved, light green. Blades narrowly oblong or oblanceolate, 10-25 cm. long, 3-6.5 cm. wide, papyraceous or slightly coriaceous, glabrate, acute at apex, acute or rounded at base, revolute at margin, with 25-35 or more straight parallel lateral nerves on each side departing at angle almost 90° , above dark green and slightly shiny or dull, beneath whitish green with prominent yellowish nerves.

Dioecious. Panicles axillary, 3-7 cm. long, with many puberulent flowers on stout puberulent branches. Staminate flowers several fasciculate, on slender puberulent pedicels 2 mm. long, 2 mm. long, with yellowish calyx 3-lobed more than half to base. androecium of slender filament 0.5-1 mm. long and connate anthers 0.5 mm. long. Pistillate flowers few on slender puberulent pedicels 3 mm. long, 2-3 mm. long, with brown calyx 3-lobed more than half to base, rounded puberulent ovary 1 mm. long and 2-lobed stigma.

Fruits dehiscent drupes 1 or 2 on stout peduncle 3-4 cm. long, ellipsoid, 3 cm. long, 2.5 cm. in diameter (fresh), green, afterwards dark brown, thick-walled, 2-valved, aromatic. Seed ellipsoid, 22-25 mm. long, 14-17 mm. in diameter, nearly covered by laciniate red aril. Perhaps flowering and fruiting irregularly through the year.

Wood with whitish or cream-colored sapwood and heartwood pink or not differentiated, with a little reddish sap. Used for general light construction and plywood.

ECUADOR, ESMERALDAS: Playa de Oro, alt. 200 ft., wet tropical forest, Apr. 30, 1943, E. L. Little, Jr. 6400 (US); junction of Río Hoja Blanca and Río Hualpi, 50 km. S. of Borbón, alt. 75 m., wet forest, Sept. 15, 1965, E. L. Little, Jr., and R. G. Dixon 21065 (♂; HOLOTYPE, US; isotype, NY; wood sample, MADw); San Antonio, 20 km. S. of Borbón on Río Cayapas, alt. 60 m., wet forest, Sept. 18, 1965, E. L. Little, Jr., and R. G. Dixon 21091 (US, NY); Panadero, 7 km. E. of San Lorenzo, alt. 40 m., wet forest (fruit; US, NY; wood sample, MADw), Río Guayllabamba, 10 km. E. of Quinindé, alt. 130 m., wet forest, E. L. Little, Jr., and R. G. Dixon 21257 (fruit; US, NY); Estero Bravo, Río Pambil, alt. 70 m., July 6, 1966, C. Játiva 301 (1078; fruit, US, LA).

ECUADOR, PICHINCHA: Santo Domingo de los Colorados, alt. 1800 ft., wet tropical forest, Apr. 3, 1943, "coco," E. L. Little, Jr. 6157 (US); same locality, Feb. 27, 1965, E. L. Little, Jr. 20457 (♀; US, NY); 20 km. W. of Santo Domingo de los Colorados, alt. 1000 ft., seasonal rain forest, Oct. 21, 1961, P. C. D. Cazalet and T. D. Pennington 5123 (US).

This species is common and widely distributed in the wet tropical forest of the Pacific Coast of northwestern Ecuador in Esmeraldas and south to Santo Domingo de los Colorados, Province of Pichincha. Also in southwestern Colombia. According to a note on E. L. Little, Jr. 6400 (US), that specimen is the same species as J. Cuatrecasas 16386 (A), Colombia, El Valle, Río Caluna, alt. 5-50 m.

Fig. 19, a leafy twig with immature staminate inflorescences, is from the type collection (E. L. Little, Jr., and R. G. Dixon 21065).

Virola reidii is associated with Elbert S. Reid, Canadian forester from Vancouver, British Columbia, and director of the 5-year forestry project, including forest inventory, in Esmeraldas from 1964 to 1969. Mr. Reid assisted the tree identification work in many ways. The project reports will provide the basis for tree identification, forest management, silviculture, utilization, and development of forest industries in Esmeraldas.

Both new species of Virola described here are known by the common name "chalviande." To distinguish them in the forest, a second word was added, referring to the obvious difference in hairiness of the foliage. Virola dixonii, "chalviande (peludo)," has hairy leaves and twigs, while V. reidii, "chalviande (lampiño)," has almost hairless foliage.

A. C. Smith in his comprehensive monograph of the family cited above prepared a key in English to 6 named "species groups" of Virola (Brittonia 2: 455. 1937). J. C. Th. Uphof (Myristicaceae. In A. Engler and K. Prantl, Naturl. Pflanzenfam. 2 Aufl. Band 17a II: 205-208. 1959) changed these groups to sections, crediting authorship to Smith. Neither author provided the Latin diagnoses for valid publication (ICBN, Art. 36). Virola dixonii is referred to the group Rugulosae. Though differing somewhat in pubescence, V. reidii has flowers similar to those of V. dixonii.

CLUSIA VENUSTA Little, sp. nov. "Matapalo." Figs. 20-22.

Arbor epiphytica vel scandens dioecia ad 6-10 m. alta, trunco 8 cm. diametro. Cortex griseus laevis latice flavo. Ramuli crassi teretes glabri, atrovirentes, nodis incrassatis annulatis atque internodis nunc longis nunc brevibus. Gemmae pari foliorum juvenorum 1.5 cm. longorum formatae. Folia opposita glabra, petiolis crassis 2-3 cm. longis atrovirentibus, basi latis et vaginantibus. Laminae ellipticae, magnae, 14-30 (35) cm. longae, 7-15 (18) cm. latae, coriaceae, apice acuminatae vel interdum acutae, basi subcordatae, margine leviter revolutae, nervis lateralibus 25-35 utrinque tenuis rectis parallelis, valde impressis, sub angulo fere 90° abeuntibus prope marginem conjunctis, supra impolito-atrovirentes, subtus impolito-pallido-virides nervis valde prominentibus.

Flores terminales solitariae pedunculo breve crasso 1 cm. longo, magni venusti, in alabastro subglobosi, minimum 6 cm. lati, rosei vel rubelli. Flores masculi bracteis calycinis 2 oppositis rotundatis 15-18 mm. longis latisque, acutis vel obtusis carinatis, sepalis 4 decussatis rotundatis 2.5-5 cm. longis latisque, concavis leviter succulentis, petalis c. 8 rotundatis 4-6 cm. longis et latis, concavis parum succulentis, roseis vel rubellis, atque disco centrali complanato stamineo 4-5.5 cm. diametro et 1 cm. alto antheris numerosissimis sessilibus 1-2 mm. longis exterius congestis interioribus paucioribus majoribusque, 2-4-locularibus longitudinaliter dehiscentibus. Flores feminei bracteis calycinae 2 oppositis rotundatis 15 mm. longis, acutis carinatis, pallido-viridibus, sepalis 4 decussatis rotundatis concavis parum succulentis, petalis c. 10-11, rotundatis vel ellipticis concavis, tempore gemmatione albis, cupula staminodiali alba 6 mm. longa, 11-12 mm. diametro, ovario 17-21 lineis longitudinalibus, loculis 17-21 multiovulatis, stigmatibus 17-21 sessilibus radiantibus, linearibus, in annulo connatis.

Capsula terminalis solitaria late ovoidea 45-48 mm. longa, 42-45 mm. diametro, pallido-viridis, succulenta, lineis longitudinalibus loculisque 17-21, stigmatibus 17-21 sessilibus angustis nigricantibus 7-9 mm. longis, sepalis et petalis paucis persistentibus, pericarpio albedo 5-8 mm. crasso, 9-10 cm. lata segmentis patentibus in dehiscente ad instar stellae. Semina multa oblonga 4 mm. longa, 1 mm. lata, alba in pulpa aurantiaca inclusa.

Epiphytic tree or vine, dioecious, 6-10 m. high, with trunk 8 cm. in diameter. Bark gray, smooth, with yellow latex. Twigs stout, terete, glabrous, dark green, with thickened ringed nodes and long and short internodes. Buds formed by a pair of young leaves 1.5 cm. long. Leaves opposite, glabrous, with stout dark green petioles 2-3 cm. long, broad and sheathlike at base.

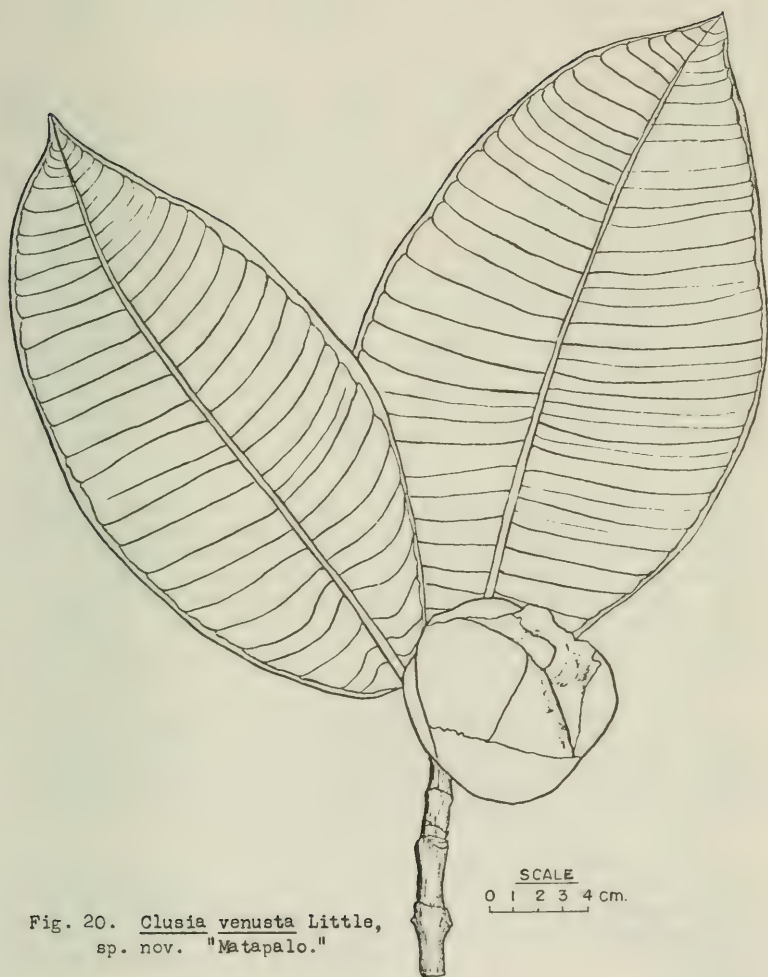


Fig. 20. Clusia venusta Little,
sp. nov. "Matapalo."

Blades elliptic, large, 14-30 (35) cm. long, 7-15 (18) cm. wide, coriaceous, apex acuminate or sometimes acute, base subcordate, margin slightly revolute, with 25-35 pairs of slender straight parallel lateral nerves very impressed, departing at nearly right angle from costa and connected near margin, above dull dark green, and beneath dull light green with lateral nerves very prominent.

Flowers terminal, solitary on short stout peduncle 1 cm. long, large, beautiful, subglobose in bud, 6 cm. or more in width, pink or reddish. Male flowers with 2 opposite rounded bracts of calyx 15-18 mm. long and broad, acute or obtuse, and keeled, 4 decussate rounded sepals, concave, slightly succulent, 2.5-5 cm. long and broad, about 8 rounded petals 4-6 cm. long and broad, slightly succulent, pink or reddish, and central flattened staminal disk 4-5.5 cm. in diameter and 1 cm. high bearing very numerous sessile anthers 1-2 mm. long, outer crowded, inner fewer and larger, 2-4-celled, longitudinally dehiscent. Female flowers with 2 opposite rounded bracts of calyx 15 mm. long, acute and keeled, light green, 4 decussate rounded sepals, concave, slightly succulent, about 10-11 rounded or elliptic concave petals whitish in bud, white staminal cup 6 mm. long and 10-12 mm. in diameter, and ovary with 17-21 longitudinal lines, 17-21 cells many-ovuled, 17-21 sessile radiating linear stigmas connate in ring.

Capsule terminal, solitary, broadly ovoid, 45-48 mm. long and 43-45 mm. in diameter, light green, succulent, with 17-21 longitudinal lines and cells, with 17-21 sessile narrow blackish stigmas 7-9 mm. long, with sepals and few petals persistent, with whitish pericarp 5-8 mm. thick, in dehiscence 9-10 cm. broad with segments spreading starlike. Seeds many, oblong, 4 mm. long, 1 mm. broad, whitish, in orange pulp. Perhaps with flowers and fruits through the year.

ECUADOR, ESMERALDAS: Junction of Río Hoja Blanca and Río Hualpi, alt. 75 m., wet tropical forest, Sept. 14, 1965, E. L. Little, Jr., and R. G. Dixon 21054 (♂; US, NY); Río Pambil near junction with Estero Capulí, alt. 150 m., July 3, 1966, Carlos Játiva and Carl Epling 1058 (immature fruit; US, LA).

ECUADOR, PICHINCHA: Santo Domingo de los Colorados, alt. 620 m., wet tropical forest, Feb. 27, 1965, E. L. Little, Jr. 20450 (♀ buds, fruit; HOLOTYPE, US; isotype, NY); 20 km. W. of Santo Domingo de los Colorados, alt. 1000 ft., seasonal rain forest, Nov. 1, 1961, P. C. D. Cazalet and T. D. Pennington 5233 (US).

Clusia venusta is common in the wet tropical forest of Esmeraldas and Pichincha, south at least to Santo Domingo de los Colorados at 620 m. altitude.



Fig. 21. *Clusia venusta* Little, sp. nov. "Matapalo."

Fig. 20 shows a leafy twig with large male flower bud (E. L. Little, Jr., and R. G. Dixon 21054). Fig. 21 illustrates a twig with mature capsule. Fig. 22, A, side view of immature female flower bud; B and C, end and side views of the same mature capsule with 21 carpels. Figs. 21 and 22 are from the type collection (E. L. Little, Jr. 20450). All drawings, also the descriptions, were made from fresh specimens.

This handsome epiphytic woody vine is easily recognized by its large showy solitary flowers, its distinctive leaves with prominent veins, and the large fruits with numerous carpels. The leaves are coriaceous, not succulent as in most species of the genus, and acuminate. Lateral nerves are conspicuous and unusual, about 25-35 on each side of costa departing nearly at right angle, slender, straight, and parallel, and connected near margin.

The number of carpels is very high, 17-21, as shown readily by the numbers of stigmas, lines on outside of fruit and segments of dehiscence, and cells or locules in ovary in capsule. In Clusia the characteristic number of carpels is 5-10, rarely 12 or more. Apparently, this species has the highest number yet recorded in this genus. However, 2 Ecuadoran species named from collections in the 1943 forest survey have numbers nearly as great, as indicated by their names. C. polystigma Little (Wash. Acad. Sci. Jour. 38: 104, fig. 15. 1948), a large woody vine collected at San Lorenzo, Esmeraldas, has 16-19 carpels. C. plurivalvis Little (Wash. Acad. Sci. Jour. 38: 102, fig. 17. 1948), an erect tree from Huigra, Province of Chimborazo, has 13-16 carpels.

Clusia L. has perhaps nearly 200 named species in tropical America. The genus is particularly well represented in the Andes of Colombia. Fifty species were described from that country in an article by José Cuatrecasas (Notas a la Flora de Colombia. X. Acad. Colomb. Cienc. Revista 8: 33-64, illus. 1950). Clusia dixonii Little (Phytologia 18: 468, fig. 15. 1969) was collected in the Andes of Ecuador near the border of Esmeraldas.

The relationships of Clusia venusta are uncertain. It resembles slightly C. crenata Cuatr. (Acad. Colomb. Cienc. Revista 8: 42, pl. 1. 1950) of Departamento del Valle, Cordillera Occidental of Colombia. That species is one of few in Colombia with coriaceous leaves and very impressed veins. It was referred by its author to Clusia sect. Phloiandra, though not typical. The last classification of subgeneric ranks in Clusia was by A. Engler (in A. Engler and K. Prantl, Natürl. Pflanzenfam. 2 Aufl. 21: 198-204, illus. 1925).

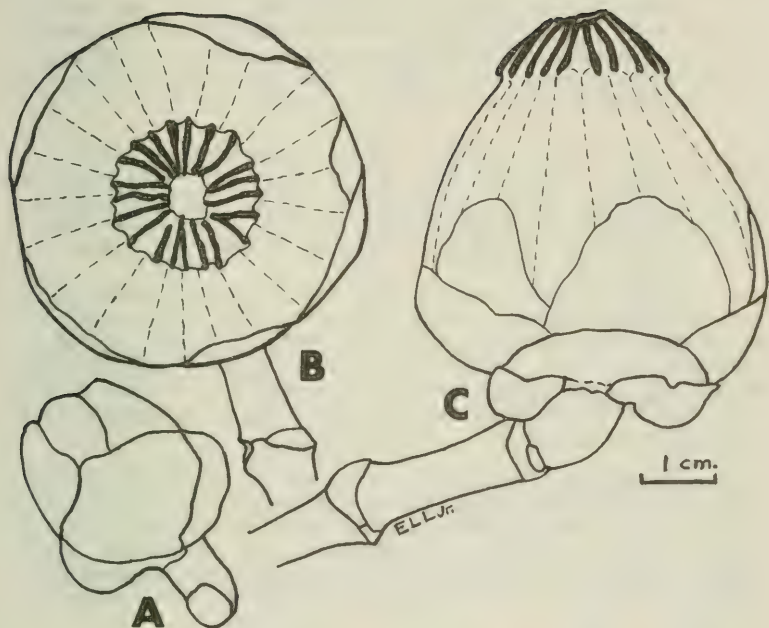


Fig. 22. *Clusia venusta* Little, sp. nov.
"Matapalo." A, side view of immature female
flower bud. B and C, end and side views of
the same mature capsule with 21 carpels.

INGA SPECTABILIS (Vahl) Willd. var. **SCHIMPFII** (Harms) Little, comb. nov. "Guaba machetón," "guabo machete." Fig. 23.

Inga schimpfii Harms, Repert. Sp. Nov. Fedde 43: 112. 1938.

The type of Inga schimpfii Harms was collected west of Bucay, Province of Bolívar, Ecuador, alt. 300 m., on a tributary of Río Chimbo, Apr. 20, 1934 (H. J. F. Schimpff 1032; isotype seen at US). In the original description, Harms noted the close relationship with Inga spectabilis, which differed in having larger flowers and broader ovate floral bracts. However, the foliage and angled twigs were very related. (The giant legumes like machetes, lacking in the isotype, are similar too.)

In the 1943 forest survey I collected specimens at Pichilingue, Province of Los Ríos, alt. 45 m., noting that this was a common shade tree in cacao plantations (E. L. Little, Jr. 6495, May 22, 1943; US; Caribbean Forester 9: 240. 1948). The identification as Inga schimpfii was made by Ellsworth P. Killip.

The U. S. National Herbarium (US) has these additional specimens, all from Ecuador: Province of Chimborazo, Río Chanchan near Huigra, 4000-4500 ft., May 7-14, 1945, W. H. Camp E-3228; Galápagos Is., Santa Cruz Is., introduced, Ira L. Wiggins 18528 and Luis A. Fournier 261; Province of Esmeraldas, Businga on Río Verde, wet forest, alt. 300 m., Oct. 1, 1965, E. L. Little, Jr., and R. G. Dixon 21191.

Inga spectabilis (Vahl) Willd. (Sp. Pl. Ed. 4, 4: 1017. 1806) is recorded from Costa Rica, Panama, Colombia, and Venezuela, apparently also from Mexico, by Jorge León (Central American and West Indian species of Inga (Leguminosae). Mo. Bot. Gard. Ann. 53: 322-323. 1966). Reduction of I. schimpfii to synonymy has been suggested, but the relationship is that of a geographical variety.

Inga schimpfii is united here as a southern, small-flowered variety with narrow corolla less than 15 mm. long and smaller floral bracts, extending the range of I. spectabilis southward to western Ecuador. The typical variety has corollas 18-24 mm. long, according to León.

Fig. 23 shows a leaf and a legume from a wild tree in Esmeraldas (E. L. Little, Jr., and R. G. Dixon 21191) but lacks the flowers, which characterize the variety.

(To be continued.)

Forest Service, United States Department of Agriculture,
Washington, D. C. 20250.



Fig. 23. Inga spectabilis var. schimpfii (Harms) Little.
"Guaba machetón."

PRELIMINARY STUDIES OF PITCAIRNIA
IN THE EASTERN CARIBBEAN

Robert W. Read*

This study is by no means intended to be a monograph of the genus Pitcairnia in the eastern Caribbean. Rather, based on extensive recent collections and field observations, it is an attempt to circumscribe the taxa more accurately and help to eliminate where possible the innumerable misidentifications and misleading synonymies, which are characteristic of these formerly inadequately known species. Thus hopefully making future studies and collections more meaningful. All too frequently we have been forced to place too much emphasis on fragmentary specimens without having any understanding of individual or population variability. Keys made from such specimens are inevitably cumbersome and extremely artificial (even erroneous at times), with little meaning in regard to the actual range of variability of a species.

The ideal method, of course, is to study the plants in the field under varying ecologies throughout its range of distribution. For only then can incomplete specimens be understood and placed in their proper places. Furthermore illustrations based on cultivated plants in European Gardens of the last century are not only subject to the artist's ability to observe intimate details but to his whimsy as well. Source data from cultivated material cannot always be relied upon, for once a cultivated plant is identified with an earlier collection the source of that earlier collection frequently becomes tied to the second, if formerly unknown or dubious. The genus Pitcairnia has been carefully studied in Puerto Rico, Dominica, Martinique and Grenada. Additional information is based on literature and available herbarium material.

As was emphasized in another paper on Variation and Taxonomy of Pitcairnia (Brittonia 21(1):83-90. 1969), certain classical characters used in distinguishing between taxa of Pitcairnia in the West Indies, i.e. leaf width, pedicel length etc., are much too variable even within local populations to be of any taxonomic value. For example P. angustifolia which ranges from Puerto Rico to Grenada, (mostly on exposed rocks at lower elevations) is extremely variable in the branching of the inflorescence and the width of the leaves. It most commonly has a fairly highly branched, often thrice branched, inflorescence. However plants with a simple inflorescence may be found in the mountains

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of Puerto Rico and the Virgin Islands. The leaves of P. angustifolia may vary in width from as little as 10 mm to as much as 47 mm in a single population. The narrower leaves occurring on plants in very exposed situations and the wider leaves being produced in moist shade. The distinction between species exhibiting dimorphic leaves and those lacking dimorphic leaves has proven to be completely erroneous. The spinose sterile rosettes have rarely been collected and even more rarely appear on herbarium sheets although every Pitcairnia collected thus far in the author's studies has had spinose sterile rosettes. These are immediately obvious to anyone attempting to collect living material for cultivation.

There appear to be at least six distinct species of Pitcairnia occurring on the islands between Puerto Rico and Trinidad. Pitcairnia integrifolia, P. angustifolia, P. sulphurea and P. micotrinensis, the latter herein described for the first time, are easily characterized and occur in fairly well defined ecological habitats. However P. bifrons from St. Kitts and Guadeloupe has not been adequately studied and may in fact comprise two taxa.

Pitcairnia spicata, has long been an enigma. Almost any plant with a spicate inflorescence has at one time or another been identified with this name. The species apparently is however restricted to Martinique and has in fact proven to be even more of an enigma now that it has been typified. This species is typically spicate of inflorescence and is a characteristic plant of the moist ash slopes and rocky peaks of Mt. Pelee. Further down the slopes inflorescences with small lateral branches may be found and on the dry coastal rock both spicate and slightly branched inflorescences may occur. In addition, the floral bracts of the high elevation forms are long and conspicuous where those at lower elevations may be quite variable. Observations in the field, have led me to believe that there has possibly been extensive hybridization and introgression in the remote past with a closely allied species, possibly P. angustifolia.

The author wishes to gratefully acknowledge the assistance and patience generously given by Dr. Lyman B. Smith, of the Smithsonian Institution; and for assistance provided by the Smithsonian Dominica Flora Project which made the study of the new species possible.

KEY TO SPECIES OF PITCAIRNIA OF THE EASTERN CARIBBEAN & JAMAICA

- A. Upper portion of the leaf sheath glabrous abaxially;
floral pedicels 9-34 (7-36) mm long; endemic, Jamaica.
P. bromeliifolia.
- AA. Upper portion of the leaf sheath densely lepidote
abaxially; floral pedicels 4-15 (3-17) mm long;
- B. Inflorescence simple (sparsely branched in P. spicata);
flowers crowded; the lowermost floral bracts more
than 6 mm broad; floral pedicels and ovaries densely
lepidote at anthesis;
- C. Leaf blades glabrous abaxially, except at the base
and apex; flowers strongly decurved following
anthesis; petals more than 11 mm wide; endemic,
Dominica. 6. P. micotrinensis.
- CC. Leaf blades densely lepidote abaxially; flowers
not strongly decurved following anthesis; petals
less than 10 mm wide;
- D. Floral bracts in the upper $\frac{1}{4}$ of the flowering
portion more than 14 mm long; petals more than
7 mm wide;
- E. Sepals glabrous to glabrescent at anthesis,
acute or rounded apically; leaf base margins
serrate (occasionally with few teeth); petals
red-scarlet; St. Kitts & Guadeloupe. 4. P. bifrons.
- EE. Sepals covered with numerous irregular multi-
cellular hairs at anthesis, acuminate to
attenuate apically; leaf base margins entire;
petals cream-colored to yellow; endemic, St.
Vincent. 5. P. sulphurea.
- DD. Floral bracts in the upper $\frac{1}{4}$ of the flowering
portion less than 13 mm long; petals less than
6 mm wide, bright red to scarlet; endemic(?),
Martinique. 3. P. spicata.
- BB. Inflorescence much branched (rarely simple);
flowers widely spaced; lowermost floral bracts
less than 5 (6) mm broad; floral pedicels and
ovaries lightly lepidote to glabrescent at
anthesis;
- F. Leaf sheath strongly serrate; leaf blade 13-30
(10-47) mm wide; petals 42-52 (40-56) mm long,
6-8 mm wide; sepals neither slender nor atten-
uate; petals always appendaged; Puerto Rico and
Lesser Antilles. 1. P. angustifolia.
- FF. Leaf sheath entire (occasionally toothed in
transitional leaves); leaf blade 5-15 (18) mm
wide; petals 35-40 (45) mm long, 5-5.5 mm wide;
sepals apex long slender attenuate; petals
naked or appendaged; Trinidad and Venezuela.
2. P. integrifolia.

1. PITCAIRNIA ANGUSTIFOLIA [Solander in] Aiton, Hort. Kew 1:401. 1789. (non Hepetis angustifolia Sw. 1788).
TYPE: VIRGIN ISLANDS; St. Croix, J. Ryan s.n. (HOLOTYPE: BM; photo US).
- P. latifolia [Solander in] Aiton, Hort. Kew 1:401. 1789. Type: Anderson s.n. in hort. Kew (HOLOTYPE: BM; photo US).
- P. ramosa Jacqin f. Eclog. Pl. 1:154. 1816. Type: Illust. in Eclog. Pl. pl. 79 (as P. furfuracea). 1809.
- P. platyphylla Schrader, Blumenb. 26. 1827. Type: Illust. in Andrews Bot. Repos. t. 322 (as P. latifolia). 1803.
- P. redouteana Schultes f. in Roemer and Schultes, Syst. Veg. 7(2):1243. 1830. Type Illust. in Redouté, Lil. 2:pl. 76. (as P. angustifolia). 1804.
- P. gracilis Mez. DC. Monogr. Phan. 9:407. 1896. Type: Guadeloupe, L'Herminier s.n. (HOLOTYPE: G; photo US).
- Hepetis gracilis (Mez) Mez, DC. Monogr. Phan. 9:973. 1896.
- H. latifolia (Aiton) Mez, DC. Monogr. Phan. 9:974. 1896.
- H. platyphylla (Schrader) Mez, DC. Monogr. Phan. 9:974. 1896

Plants 0.5-1.5 m tall, acaulescent or with very short obscure rhizomes; leaves persistent, dimorphic, those of mature rosettes 5-12 dm long, arching with pendulous apices; sheaths upper portion densely lepidote abaxially, the margins armed with conspicuous dark corneous teeth; blades linear-lanceolate serrate to subentire (or entire) throughout their greater length, 13-30(10-47) mm wide at the widest point, densely covered abaxially with a continuous layer of coalesced fimbriate silvery scales, rarely glabrescent; inflorescence erect or ascending, usually twice or thrice branched, rarely simple, variously floccose-lepidote to glabrescent; branches laxly flowered; scape-bracts serrate, foliaceous, exceeding the internodes basally but often shorter above; primary bracts like the upper scape bracts; floral bracts narrowly triangular linear-lanceolate 4-12(3-18) mm long by 2-4.5(-6) mm broad, those of the upper 1/3 of the inflorescence 3-12 mm long; flowers erect or ascending at anthesis; pedicels slender, lightly lepidote at anthesis, 4-14(3-17) mm long; sepals 15-23(13-24) mm long, acute to rounded apiculate apically; petals red, 42-52(40-56) mm long by 6-8 mm wide, appendaged inside near the base; ovary lightly lepidote to glabrescent at anthesis.

Distribution: Mostly lower elevations Puerto Rico to Grenada.

Specimens examined:

PUERTO RICO: Luquillo Mts., Bañadero, Apr. 1883, Eggers 1239 (US); June 1885, Sintenis 1586 (US); Monte Florida, Juncos, Aug. 1885, Sintenis 2564 (US); Cayey, Rio Morillos, Oct. 1885, Sintenis 2270 (US); Candelaria, Nov. 1899, Goll 267 (US); Coamo Rd., Peñon, Nov. 1899, Goll 633 (US); Aquirre, June 1901, Underwood & Griggs 418 (US); Yanco, July 1901, Underwood & Griggs 644 (US); Vega Baja, 1912, Stevenson & Johnston 456 (US); Bayamon,

Aug. 1913, Stevenson & Johnston 911 (US); July 1968, Read 2053 (US); Hato Arrieta, Arecibo, Mar. 1914, Britton & Cowell 1981 (US); Rio Cubuy, Sierra de Naguabo, July 1914, Shafer 3162 (US); Utuado, Mar. 1915, Britton 5152 (US); Maricao, Apr. 1935, Sargent 419 (US); San German, Apr. 1935, Sargent 443 (US); El Yunque, July 1938, Sargent 557 (US); Rio Grande, June 1968, Read 2049 (US); Vieques Island, Cerro Ventana, Feb. 1914, Shafer 2877 (US).

VIRGIN ISLANDS: St. Thomas; Cowells Hill, Oct. 1881, Eggers s.n. (US); Water Island, Jan.-Feb. 1913, Britton & Schafer 135 (US); Tortola; Road town to Sea Cow Bay, Feb. 1913, Britton & Schafer 696 (US); St. Croix, 1777, Ryan s.n. (HOLOTYPE, BM; photo US).

ANTIGUA: Wulfschlaegel 559 (GOET, photo US); Boggy Peak, May 1937, Box 807 (US).

MONTserrat: Rendezvous, Feb. 1907, Schafer 440 (US); Soufrière Feb. 1907, Schafer 688 (US); Jan. 1950, Velez 3704 (US).

GUADELOUPE: Baines Jaunes, Matouba, July 1935, Stehlé 226 (US); June 1937, Stehlé 1766 (US); Honélmont, June 1935, Stehlé 593 (US); Sainte Rose, June 1937, Stehlé 1804 (US); Chutes du Carbet, July 1937, Stehlé 2034 (US); Lamentin, Mar. 1938, Questel 778 (US); Les Saintes, June 1940, Questel 1685 (US); Questel 778 A & B (US); without locality, L'Herminier s.n. (HOLOTYPE of P. gracilis Mez, G; photo US).

DOMINICA: Soufrière Valley, Mar. 1933, Cooper 194 (US); Castle Bruce Rd., June 1958, Solheim 5609 (US); Roseau Valley, May-June 1950, Howard 11740 (US); Near Trafalgar Falls, Apr. 1964 Ernst 1083 (US); Roseau to Fresh Water Lake, May 1968, Read 2020 (US); Mero, May 1968, Read 2022 (US); Northeast coast, May 1968, Read 2030 (US); without locality, July 1881, Imray s.n. (K; photo US); Bout Sable Bay, St. David Parish, Nov. 1964, Nicholson 1990 (US); Grande Savanne, St. Joseph Parish, July 1965, Ernst 1894 (US); Morne Couronne, St. Joseph Parish, June 1965, Webster 13222 (US); Morne Trois Pitons, St. Paul Parish, Aug. 1965, Ernst 2047 (US); Pont Cassé, St. Paul Parish, July 1964, Wilbur et al 7739 (US); Mango hole Bay, St. Andrews Parish, Wilbur et al 8038 (US); Locality omitted, June 1967, Wasshausen & Ayensu 366 (US); June 1958, Solheim & Solheim 5609 (US); Jan.-Mar. 1933, Cooper 194 (US); Jan 1932, Fairchild 2723 (US).

MARTINIQUE: South coast, Sept. 1937, Stehlé 2302 (US); Casa Pilota, May 1950, Howard 11715 (US).

SAINT LUCIA: The Morne Castries, May 1945, Beard 1016 (US); Hot Springs, Oct. 1949, Velez 3323 (US); Le Toc to Cul de Sac Bay Apr.-May 1950, Howard 11379 (US); Soufrière, Apr.-May 1950, Howard 11539 (US); Apr.-May 1950, Howard 11572 (US); Marigot Bay,

Apr. 1959, Cowan 1577 (US).

SAINT VINCENT: Liberty Lodge, Dec. 1889, Eggers 6712 (US);
Kingstown, Apr. 1947, Morton 4752 (US); Jan. 1890, Krause 3499
(B, photo US); Fort Charlotte, May 1947, Morton 5726 (US); Oct.
1949, Vélez 3356 (US).

GRENADINES: Union Island, Mar.-Apr. 1950, Howard 10984 (US);
Bequia, Mar.-Apr. 1950, Howard 11255 (US).

GRENADA: Dec. 1889, Eggers 6274 (US); St. George, Nov. 1904,
Broadway s.n.(US); Grand Etang, Sept. 1945, Beard 1191 (US);
Victoria, Feb.-Mar. 1950, Howard 10709 (US); St. Georges to Grand
Etang, May 1968, Read 2039 (US).

2. PITCAIRNIA INTEGRIFOLIA Ker-Gawler, Bot. Mag. 36: t. 1462.
1812.

TYPE: None known; Bot. Mag. t.1462 is a suitable Lectotype.
P. tenuis Mez, DC. Monogr. Phan. 9:421. 1896. Type: "Colom-
bia" [Sic] Venezuela, 1844, Moritz 451 (HOLOTYPE:
B; ISOTYPE: BM; photos US).

Hepetis integrifolia (Ker-Gawler) Mez, DC. Monogr. Phan.
9:974. 1896.

H. tenuis (Mez) Mez, DC. Monogr. Phan. 9:974. 1896.

Pitcairnia hartmannii Mez, Repert. Sp. Nov. 16:8. 1919.

Type: "Insula Trinidad Venezuela," 7.4.1911, Hart-
mann s.n. (B; photo US).

Plants 0.5-1.0 m tall, acaulescent or very shortly caulescent;
leaves persistent, dimorphic; those of mature rosettes to 9 dm
long, arching with attenuate, pendulous apices; sheaths upper
portion densely lepidote abaxially, the margins mostly entire
except for transitional leaves; blades linear-lanceolate mostly
entire to base, 5-15(-18) mm wide at the widest point, densely to
scattered lepidote abaxially; inflorescence slender, erect, twice
branched; branches laxly flowered; scape bracts foliaceous,
entire to rarely lightly serrate, about equaling internodes;
primary bracts inconspicuous; floral bracts lanceolate, 7-17(6-24)
mm long by less than 5(-6) mm broad; flowers spreading; pedicels
slender, lightly lepidote to glabrescent at anthesis, 9-15 mm
long; sepals 11-17(-20) mm long, slender attenuate apically;
petals red, 35-40(-45) mm long, 5.0-5.5 mm wide, naked or append-
aged inside near the base; ovary lightly lepidote to glabrescent
at anthesis.

Distribution: Mostly lower elevations, northeastern Venezuela and
northern Trinidad.

Specimens examined:

VENEZUELA: Sucre Cumana 1842, Funk 58 (K; photo US); Cristobal Colon, Jan.-Feb. 1923, Broadway 469 (US); Puerto de Hierro, Aug. 1961, Aristeguieta & Agostini 4764 (US); Rio Grande to Mejillones, Paria Peninsula, Aug. 1961, Aristeguieta & Agostini 4787 (US).

TRINIDAD: Carenage, Mar. 1920, Britton & Hazen 233 (US); Chacachacare, Nov. 1958, Aitken 288 & 289 (US); Chaguaramas, Apr. 1921, Britton 2715 (US); Aug. 1959, Webster & Miller 9941 (US); Lower Platanal Valley, Pittendrigh 1503 (US); San Souci, Jul. 1955, Aitken & Downs 65 (US); Saffron, Sept. 1947, Friend 220 (US); Locality ?, June 1903, Johnson 109 (US).

3. PITCAIRNIA SPICATA (Lamarck) Mez, DC. Monogr. Phan. 9:392. 1896.

Bromelia spicata Lamarck, Encyl. Method. 1:146. 1783.

TYPE: MARTINIQUE; No specimen cited but the illustration by Plumier, Bromelia pyramidata ... in Mus. D'Hist. Nat. Paris (photo US), is a suitable lectotype. (See also; ed. Burman 1757, Pl. Amer. fasc. 3, p. 52, t. 63).

Hepetis spicata (Lamarck) Mez, DC. Monogr. Phan. 9:974. 1896.

Plants 1-1.5 m tall, acaulescent or very shortly caulescent; leaves persistent, dimorphic; those of mature rosettes 5-12 dm long, arching with pendulous apices; sheaths upper portion densely lepidote abaxially, the margins serrate, rarely entire in some few transitional leaves; blades linear-lanceolate mostly entire throughout their length, 16-25(-30) mm broad at broadest point, covered abaxially with a continuous layer of coalesced fimbriate silvery scales; scape stout, erect or ascending; inflorescence mostly simple, spicate, occasionally with small lateral branches when at low elevations, white lepidote to glabrescent; scape bracts entire; spikes densely flowered; lowermost floral bracts more than 6 mm broad by 16-38(6-45) mm long, those in the upper $\frac{1}{4}$ of the flowering portion less than 13 mm long; flowers not strongly decurved following anthesis; pedicels (6-)8-11 mm long, densely lepidote at anthesis; sepals 17-20(16-23) mm long, rounded, apiculate apically; petals red, 42-47(32-48) mm long, 5-5.5 mm broad, appendaged inside near the base; ovary densely lepidote at anthesis.

Distribution: Mostly high elevations, apparently restricted to the slopes of Mt. Pelee, Martinique.

Specimens examined:

MARTINIQUE: Hort. Berol. Dec. 1842. (Mus. Bot. Berol. Film Nr. 88875; photo US); (Mus. Bot. Berol. Film Nr. 88876; photo US);

Iseret 1787 (C; photo US); Trois Ilets, Sept. 1937, Stehlé 2302 (US); Casa Pilota, May 1950, Howard 11715 (US); Three miles north-west of Fort de France on road to Case-Pilote, semi-xerophytic, May 1968, Read 2031 (US); Road from St. Pierre to Morne Rouge, May 1968, Read 2032 (US); Upper slopes of Mt. Pelee near crater, May 1968, Read 2033 (US); July 1939, Egler & Seifriz 39-82 (NY).

4. PITCAIRNIA BIFRONS (Lindley) R. W. Read comb. nov.

?Bilbergia bifrons Lindley, Journ. Hort. Soc. London 8:54. 1853.

TYPE: DeJonghe in Hort. Soc. London s.n. (CGE; photo US) without locality.

Pitcairnia bracteata [Dryander in] Aiton, Hort. Kew. ed. 2, 2:202. 1811. nom. illeg. Type: Illust. in Redouté, Les Liliacees, pl. 73. (as P. latifolia). 1804.

P. commutata Regel, Gartenflora 16:289, t. 557. 1867. Type: Illust. in Regel, Gartenflora t. 557. 1867.

P. bracteata var. commutata (Regel) Regel, Gartenflora 17:8. 1868.

P. spicata forma latior Smith, Phytologia 15: 196. 1967. Type: St. Kitts, June 1950, Howard 11945 (US).

Plants less than 1 m tall in flower, with very short obscure rhizomes or none; leaves probably dimorphic although spiny rosettes not known in collections; leaves of mature rosettes over 7 dm long, entire; sheaths upper portion densely lepidote abaxially, the margins serrate, rarely with few teeth; blades narrowly lanceolate, attenuate, entire throughout, 20-32 mm broad at the broadest point, densely covered abaxially with a continuous layer of coalesced silvery adpressed scales; scape erect, always simple, densely flowered; scape bracts entire; floral bracts ovate to ovate-lanceolate 27-56 mm long, (5-7)8-12 mm wide, those of the upper $\frac{1}{4}$ of the inflorescence 14-32 mm long; flowers divergent following anthesis; pedicels (2-3)4-13 mm long, densely lepidote at anthesis; sepals 20-25 mm long, lanceolate, acute to rounded apically, glabrous to glabrescent at anthesis; petals reddish-scarlet (yellow? in Questel 1662), 37-52 mm long, ca. 8 mm wide, appendaged inside near the base; ovary densely floccose-lepidote at anthesis.

Distribution: St. Kitts and Guadeloupe.

Specimens examined:

ST. KITTS: Dos-d'Ans (Dodans) Pond, June 1950, Howard 11945 (HOLOTYPE of P. spicata forma latior Smith, US; ISOTYPE, GH); Summit of Mt. Misery, Sept.-Oct. 1901, Britton & Cowell 552 (NY).

GUADELOUPE: Soufrière; 1893, Duss 3315 (GH;NY;US); Feb. 1935, Stehlé 1 (US); Aug. 1939, Questel 1662 (US).

5. PITCAIRNIA SULPHUREA Andrews, Bot. Repos. 4:pl. 249. 1802.
 TYPE: ST. VINCENT; Anderson s.n. (BM).
P. bracteata var. ♂ [Dryander in] Aiton, Hort. Kew.
 ed. 2, 2:202. 1811. (Based on P. sulphurea Andrews).
P. bracteata var. sulphurea (Andrews) Ker-Gawler, Bot. Mag.
 34:t. 1416. 1811.
P. spicata var. sulphurea (Andrews) Mez, DC. Monogr. Phan.
 9:393. 1896.
Hepetis spicata var. sulphurea (Andrews) Mez, DC. Monogr.
 Phan. 9:974. 1896. (as "sulfurea").
Tillandsia vincentiensis Krause, Beihefte Bot. Centralbl.
 32(2):337. 1914. Type: St. Vincent; Souffrière, 1890,
E.H.L. Krause 3498 (B; photo US).
Pitcairnia spicata forma pallida L.B. Smith, Phytologia 15:
 196. 1967. Type: St. Vincent; Apr. 1947, C.V. Morton
5252 (US).

Plants 1 m tall, acaulescent or with a short obscure rhizome; leaves persistent, most likely dimorphic, those of mature rosettes 1 m or more long, entire (or rarely slightly serrate toward the base); sheaths upper portion densely lepidote abaxially, the margins entire; blades lanceolate-attenuate, 18-42 mm broad at the widest point, densely covered abaxially with a continuous layer of silvery coalesced scales; scape stout, erect, unbranched, densely flowered; scape bracts mostly entire (rarely serrate); floral bracts narrowly triangular, 30-55 mm long, (4.5-)6-11 mm wide, the lowermost exceeding the sepals, those of the upper $\frac{1}{4}$ of the inflorescence 15-25 mm long; flowers spreading following anthesis; pedicels slender, densely lepidote at anthesis, 7-11 mm long; sepals narrowly lanceolate, 21-25 mm long, with numerous irregular multicellular hairs at anthesis, acuminate-attenuate apically; petals yellow (to white), 40-45 mm long, 7-9.5 mm wide, appendaged inside near the base; ovary densely lepidote at anthesis.

Distribution: St. Vincent, endemic.

Specimens examined:

Souffrière, Oct. 1949, Vélez 3392 (US); Apr. 1950, Howard 11220 (US); without locality; Feb. 1932, Fairchild 2767 (US); May-July 1890, H.H. & G.W. Smith 624 (K; photo US); Sept. 1889, H.H. & G.W. Smith 856 (Columbia Univ.; photo US); Feb. 1890, Krause 3498 (B, TYPE of Tillandsia vincentiensis Krause; photo US); Apr. 1947, Morton 5252 (US, TYPE of Pitcairnia spicata forma pallida L.B. Smith); Mar. 1962, Cooley 8558 (GH).

6. PITCAIRNIA MICOTRINENSIS R. W. Read sp. nov.

Species insignis floribus suis valde decurvatis post anthesin, a speciebus nobis notis bene distincta; scapo simplicissimo;

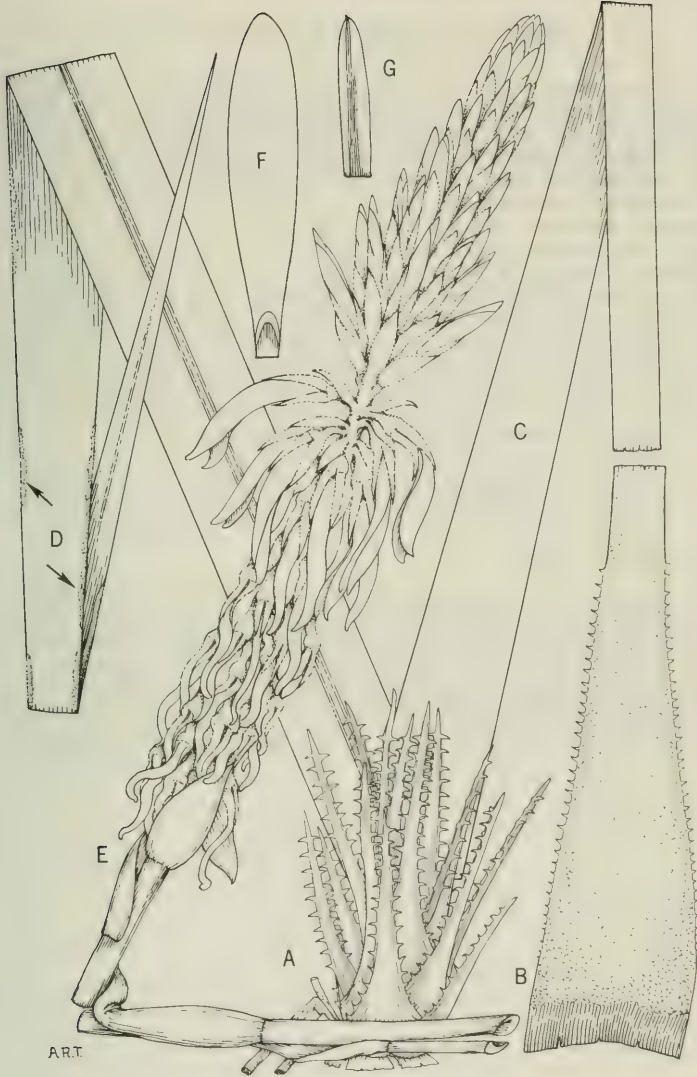


Plate I. *Pitcairnia micotrinensis* R. W. Read, sp. nov.

foliis glabris, integris; calycibus viridis, lepidotis dense, et corollis flavis vel persicinis.

TYPE: DOMINICA; R.W. Read & W.R. Ernst 2018 (US).

Plants acaulescent or with stout stems to 20 cm long; leaves dimorphic, those of the sterile offshoots dark corneous barbed spines 4-10 cm long; leaves of mature rosettes to 1.5 m long; leaf sheaths densely lepidote abaxially except for the basal 1-2 cm, the margins strongly saw-toothed; leaf blades narrowly lanceolate, attenuate, entire, 28-37 mm wide at the widest point, glabrous abaxially except for a narrow line of scales along the upper margins and apex; scape stout, erect to 1.5 m tall, densely flowered, arachnoid lepidote throughout; scape bracts entire; floral bracts lanceolate, 32-40 mm long, 7-14 mm wide, those of the upper 1/3 of the inflorescence 16-20 mm long; flowers spreading at anthesis but strongly decurved immediately following; pedicels 5-10 mm long, densely lepidote at anthesis; sepals 19-29 mm long, rounded apiculate apically; petals lanceolate, yellow through peach colored, 45-55 mm long, ca. 13 mm wide, appendaged inside near the base; ovary densely lepidote at anthesis.

Distribution: Dominica, open ridges and mountain summits throughout the island, endemic.

Specimens examined:

Laudat, 1903, Lloyd 311 (NY); Morne Trois Pitons, Aug. 1938, Hodge 319 (GH, NY); Sept. 1962, Kimber 976 (WIS); July 1964, Wilbur et al 8107 (US); Feb. 1966, Chambers 2752 (US); Valley of Desolation, Mar. 1940, Hodge & Hodge 1950 (GH); Morne Diablotin, June 1965, Webster 13369 (US); Ridges above Fresh Water Lake, May 1968, Read & Ernst 2017 (BH,US); 2018 (HOLOTYPE:US): 2019 (US); without locality; Sept. 1888, Ramage s.n. (K; photo US).

NOTES ON BROMELIACEAE, XXX

Lyman B. Smith

Of necessity the present publication is the last preliminary before completing the manuscript of the subfamily Pitcairnioideae in my coming monograph. At the same time I am using this opportunity to publish a small accumulation of notes on the other subfamilies of the Bromeliaceae.

AECHMEA

AECHMEA R. & P. Prodr. 47. 1794. Nomen conservandum.

Gravisia Mez in Mart. Fl. Bras. 3, pt. 3: 180. 1891; 299. 1892

Originally Mez's distinction of Gravisia from Aechmea on the basis of polyporate pollen seemed a good one with correlation in the form of the inflorescence. Now, thanks chiefly to the research of Professor G. Erdtman, it appears that a good number of species that Mez classified as Aechmea have a variably polyporate pollen and that no correlation with the inflorescence remains. Consequently it is deemed necessary to transfer all the species and varieties of Gravisia to Aechmea as follows:

Gravisia aquilega (Salisb.) Mez in Mart. Fl. Bras. 3, pt. 3: 300. 1892 = AECHMEA AQUILEGA (Salisb.) Griseb. Fl. Brit. W. Ind. 592. 1864.

G. aquilega var. chrysocoma (Baker) L. B. Smith, Phytologia 8: 219. 1962 = AE. AQUILEGA var. CHRYSOCOMA (Baker) L. B. Smith, comb. nov. Based on Ae. chrysocoma Baker, Handb. Bromel. 44. 1889.

G. aripensis N. E. Brown, Bull. Torrey Bot. Club 53: 466. 1926 = AE. ARIPENSIS (N. E. Brown) Pittendrigh, Journ. Washington Acad. Sci. 48: 316. 1958.

G. brassicoides (Baker) Mez, DC. Monogr. Phan. 9: 173. 1896 = AE. BRASSICOIDES Baker, Journ. Bot. 20: 329. 1882.

G. capitata (Schult. f.) L. B. Smith, Arquiv. Bot. Estado S. Paulo II. 1: 57, pl. 73, fig. 2. 1941 = AE. CAPITATA (Schult. f.) Baker, Journ. Bot. 17: 167. 1879.

G. chrysocoma (Baker) Mez in Mart. Fl. Bras. 3, pt. 3: 301, pl. 65. 1892 = AE. AQUILEGA var. CHRYSOCOMA (Baker) L. B. Smith, cf. above.

G. constantinii Mez in Fedde Rep. Spec. Nov. 14: 245. 1916 = AE. CONSTANTINII (Mez) L. B. Smith, comb. nov.

G. exsudans (Lodd.) Mez in Mart. Fl. Bras. 3, pt. 3: 300. 1892 = AE. AQUILEGA (Salisb.) Griseb., cf. above.

G. fosteriana L. B. Smith, Phytologia 8: 218, pl. 1, fig. 1, 2. 1962, non Aechmea fosteriana L. B. Smith, 1941 = AE. MULFORDII L. B. Smith, nom. nov.

G. lanjouwii L. B. Smith, Act. Bot. Neerlandica 5: 93, fig. 3. 1956 = AE. LANJOUWII (L. B. Smith) L. B. Smith, comb. nov.

G. rodriguesiana L. B. Smith, Phytologia 13: 153, pl. 7, fig. 18, 19. 1966 = AE. RODRIGUESIANA (L. B. Smith) L. B. Smith, comb.

nov.

G. rubens L. B. Smith, Phytologia 8: 218, pl. 1, fig. 3, 4.
1962 = AE. RUBENS (L. B. Smith) L. B. Smith, comb. nov.

DYCKIA

81a. DYCKIA BRACHYPHYLLA L. B. Smith, sp. nov. A D. elongata Mez, cui verisimiliter affinis, foliis valde minoribus, sepalis subduplo brevioribus differt.

PLANT flowering to 50 cm high. LEAVES densely rosulate; sheaths wholly covered, broad, 15 mm long; blades recurved, 7 cm long, 12 mm wide, soon glabrous above, covered beneath with appressed whitish scales, very laxly serrate with nearly straight slender spines 1.5 mm long. SCAPE lateral, straight, 3 mm in diameter, white-lepidote, soon glabrous; scape-bracts ovate, acuminate, entire, much shorter than the internodes. INFLORESCENCE simple, few-flowered, 7 cm long, lax at base, sparsely white-lepidote when young. FLORAL BRACTS ovate, acuminate, shorter than the sepals, entire; flowers subsessile. SEPALs broadly ovate, rounded at apex and cucullate, 4 mm long, ecarinate; petals erect, 8 mm long, orange, the blades elliptic, ecarinate; stamens included, the filaments free; stigmas sessile. Pl. I, fig. 1: Leaf-margin x 1; fig. 2: Flower x 1; fig. 3: Sepal x 2.

BRAZIL: MINAS GERAIS: in soil, cerrado on steep rocky slopes with thin gravelly soil, 20 km southwest of Diamantina, Serra do Espinhaço, 1300 m alt, 21 January 1969, Irwin, Santos, Souza & Fonseca 22383 (US, type; NY, isotype).

75a. DYCKIA COXIMENSIS Smith & Reitz, sp. nov. D. pumilum L. B. Smith simulans sed foliorum laminis lepidibus persistentibus utrinque vestitis, inflorescentiae lepidibus rarissimis minutissimisque, sepalis triangulari-ovatis differt.

PLANT flowering 3 dm high. LEAVES incompletely known, over 10 cm long; sheaths suborbicular, 15 mm long, brown; blades recurving, narrowly triangular, 15 mm wide, pungent, covered on both sides with persistent appressed cinereous scales, very laxly serrate with flat spines 1 mm long. SCAPE erect, 2 mm in diameter, very sparsely and minutely white-lepidote; scape-bracts remote, small, ovate, acuminate, pungent. INFLORESCENCE simple, laxly few-flowered, 4 cm long; axis slender, very sparsely and minutely lepidote. FLORAL BRACTS broadly ovate, acuminate, the lower ones about equaling the sepals; flowers spreading; pedicels obconic, 1 mm long. SEPALs triangular-ovate, obtuse, 5 mm long, the posterior carinate; petals 10 mm long, orange; blade suborbicular, slightly carinate; anthers slightly exserted; filaments free above the short tube; style very short. Pl. I, fig. 4: Leaf-margin x 1; fig. 5: Flower x 1; fig. 6: Sepal x 2.

BRAZIL: MATO GROSSO: on rocks, Rio Coxim, near Rodovia Federal - BR, 20 November 1968, Reitz 7365 (HBR, type; photo US).

95a. DYCKIA CROCEA L. B. Smith, sp. nov. A D. aurea L. B. Smith, cui verisimiliter affinis, foliis angustioribus, petalorum laminis angustioribus differt.

PLANT flowering 6-12 dm high. LEAVES many, rosulate, to 25 cm

long; sheaths suborbicular, 3 cm long, yellow, glabrous and lustrous within; blades very narrowly triangular, 8-13 mm wide, covered with pale appressed scales beneath, soon glabrous above, laxly serrate with recurved or spreading spines 1-2.5 mm long. SCAPE straight or nearly so, 4-6 mm in diameter, glabrous; scape-bracts ovate, acuminate, shorter than most of the internodes, entire or inconspicuously serrulate. INFLORESCENCE normally simple, laxly many-flowered, 17-32 cm long, soon glabrous. FLORAL BRACTS spreading, ovate, acuminate, shorter than the sepals, entire. SEPALS ovate, acute, 8-9 mm long, more or less carinate; petals 15 mm long, orange, the blades elliptic, cucullate; stamens included, the filaments connate above the common tube; stigmas subsessile. Pl. I, fig. 7: Leaf-margin x 1; fig. 8: Flower x 1.

BRAZIL: PARANÁ: open fields, Paso do Pupo, Ponta Grossa, 10 October 1967, Hatschbach 17391 (US, type); 17372 (US); Rio Can-gui, Colombo, 3 October 1967, Hatschbach 17248 (US).

21b. DYCKIA FOSTERIANA L. B. Smith var. ROBUSTIOR L. B. Smith, var. nov. A var. fosteriana omnibus partibus robustioribus, foliis vix repandis, sepalis majoribus differt.

LEAVES with blades 12 mm wide, laxly serrate with mostly an-trorse spines to 4 mm long. SCAPE 6 mm in diameter. INFLORESCENCE dense. SEPALS to 9 mm long.

BRAZIL: PARANÁ: Mun. Campina Grande do Sul: in soil, crest of hill, Pico Caratuva, 1950 m alt, 5 October 1967, Hatschbach 17310 (US, type).

Further collections may indicate that this taxon is of specific rank.

95b. DYCKIA PLATYPHYLLA L. B. Smith, sp. nov. A D. aurea L. B. Smith, cui verisimiliter affinis, foliis latioribus antrorse serratis, petalorum laminis angustioribus differt.

PLANT flowering 8 dm high. LEAVES to 23 cm long; sheaths suborbicular, 5 cm long, yellowish, glabrous; blades narrowly triangular, 50 mm wide, thick, succulent, covered beneath with appressed whitish scales, glabrous above, repand-serrate with slender antrorse spines 3 mm long. SCAPE slender, much compressed at base and therefore doubtless lateral, somewhat flexuous, glabrous; scape-bracts small and much shorter than the internodes, broadly ovate and acuminate, entire or subentire, sparsely pale-lepidote. INFLORESCENCE simple, lax, many-flowered, 28 cm long, glabrous. FLORAL BRACTS broadly ovate, acuminate, the lower ones about equaling the sepals; flowers mostly suberect; pedicels stout, 1-2 mm long. SEPALS broadly ovate, rounded and cucullate, 8 mm long, ecarinate; petals 11 mm long, yellow, the blade elliptic; stamens included, the filaments connate above the common tube; stigmas sessile. Pl. I, fig. 9: Leaf-margin x 1; fig. 10: Flower x 1; fig. 11: Sepal x 2.

BRAZIL: BAHIA (?): 1948, cultivated and flowered 22 April 1969, Foster 2489 (US, type).

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ENCHOLIRIUM

ENCHOLIRIUM IRWINII L. B. Smith, sp. nov. A E. gracile L. B. Smith, cui affinis, petalis subduplo minoribus sepala paulo superantibus, bracteis florigeris pedicellos aequantibus vel superantibus; ovulis breviter caudatis differt.

PLANT flowering 1.5 m high. LEAVES (only the inner known) to 35 cm long; sheaths suborbicular, 25 mm long, castaneous beneath; blades very narrowly triangular, 12 mm wide at base, soon glabrous, laxly serrate with curved spines 3 mm long. SCAPE erect, 7 mm thick near base, glabrous; lower scape-bracts subfoliaceous with long slender blades exceeding the internodes but wholly exposing the scape, the upper greatly reduced and several times shorter than the internodes, entire, brown. INFLORESCENCE simple, lax, to 42 cm long, glabrous; axis slender, slightly flexuous. FLORAL BRACTS narrowly triangular, equaling or exceeding the pedicels, entire; pedicels subspreading, slender, to 5 mm long. SEPALS ovate, obtuse, 6 mm long, broadly convex, light green with purple spot at apex; petals elliptic, 8 mm long, light green; anthers exserted; ovules obliquely short-caudate at apex. Pl. I, fig. 12: Flower x 1.

BRAZIL: MINAS GERAIS: rocky river bank, Rio Itacambiruçu, and adjacent rocky cerrado, ca 10 km west of Grão Mogul, road to Cristália, 900 m alt, 19 Feb 1969, Irwin, Santos, Souza & Fonseca 23573 (US, type; NY, isotype).

GRAVISIA

(cf. under Aechmea)

GUZMANIA

GUZMANIA FILIORUM L. B. Smith, sp. nov. A G. retusa L. B. Smith, cui affinis, foliorum laminis latioribus vix retusis, inflorescentia angusta differt.

PLANT stemless, flowering 35 cm high. LEAVES 15-20 in a funnelform rosette, to 25 cm long, covered on both sides with pale appressed scales; sheaths broadly elliptic, 10 cm long, purple-striped; blades ligulate, rounded and apiculate, 3 cm wide. SCAPE erect, curved, hidden by the leaves; scape-bracts imbricate, broadly elliptic, apiculate, stramineous when dry, appressed-lepidote especially toward apex. INFLORESCENCE simple, (known only in fruit), dense, 10 cm long, probably 15-20 mm in diameter at anthesis, polystichous with flowers about 3-ranked. FLORAL BRACTS suberect, like the upper scape-bracts, about equaling the sepals, coriaceous, even; pedicels obconic, 3 mm long. SEPALS broadly ovate, 15 mm long, connate for 5 mm, coriaceous, even, glabrous. CAPSULE slenderly cylindric, beaked, 35 mm long; coma red-brown. Pl. I, fig. 13: Leaf-apex x 1/2; fig. 14: Inflorescence x 1/2; fig. 15: Sepals x 1.

PANAMA: PANAMA: in tree, Cerro Campana, 9 June 1968, S. F. & C. C. Smith 2 (US, type).

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GUZMANIA REMYI L. B. Smith, sp. nov. A G. apiculata L. B. Smith, cui affinis, foliis acutis, bracteis florigeris ellipticis, sepalis majoribus obtusis differt.

PLANT stemless. LEAVES about 10 in a funnelform rosette, 4 dm long, exceeding the inflorescence; sheaths broad, distinct; blades ligulate, acute and apiculate, 3 cm wide, obscurely punctulate-lepidote beneath. SCAPE erect, curved, slender, largely hidden by the leaves; scape-bracts erect, imbricate, broadly elliptic, caudate to apiculate, membranaceous. INFLORESCENCE simple, densely fusiform, 12 cm long, 3 cm in diameter, many-flowered, sterile toward apex. FLORAL BRACTS like the upper scape-bracts 35 mm long, much exceeding the sepals, obscurely lepidote; pedicels short, obconic. SEPALs elliptic, obtuse, cucullate, 17 mm long, connate for 5 mm, membranaceous. Pl. I, fig. 16: Leaf-apex x 1/2; fig. 17: Inflorescence x 1/2; fig. 18: Sepals x 1.

ECUADOR: BOLÍVAR-GUAYAS: forests between Guaranda and Bodegas (Babahoyo), November 1856, Remy s n (P, type; US, photo).

PITCAIRNIA

PITCAIRNIA subgenus PEPINIA (Brongn. ex André) Baker, Journ. Bot. 19: 227. 1881. Pepinia Brongn. ex André, Ill. Hort. 17: 32, pl. 1870. Type. Pepinia aphelandriflora (Lem.) André. (Pitcairnia aphelandriflora Lem.).

In choosing a subgeneric name for Pitcairnia with alate seeds, I overlooked the fact that Baker's name Pepinia is essentially a new combination, although on page 227 where the name is published there is no indication of a combination. However, on the previous page Baker has the note: "The following names in my view, represent only synonyms or subgenera, viz: -.....Pepinia, A. Brongn.: André....."

Since Baker listed three species, I felt free to consider P. punicea Scheidw. with alate ovules as the type and to exclude P. aphelandriflora with naked ovules as probably derived from the type with caudate ovules (Phytologia 10: 33. 1964). However, since the type and only species of the basionym is P. aphelandriflora, then it is automatically the type of the new combination. Also, upon further consideration, I believe it is more likely that in this case the naked ovule derived from the alate ovule.

Thus in my artificial key to the species of Pitcairnia, P. aphelandriflora would remain in the same place, but would become number 13 because of the change in subgenus.

166a. PITCAIRNIA SALTENSIS L. B. Smith, sp. nov. P. carnea Beer, P. macrobotrys André et P. orchidiflora Mez, in systema mea proxima sed foliorum laminis apice serrulatis subtus lepidibus patentibus vestitis, petalis lepidotis differt.

PLANT flowering over 7 dm high. LEAVES incompletely known but apparently all alike, 5 dm long; sheaths 2-3 cm long, ample, dark brown, entire; blades linear, 8 mm wide, long-attenuate and laxly serrulate toward apex, elsewhere entire, slightly narrowed toward base, pubescent-lepidote beneath. SCAPE erect, slender, white-lepidote; scape-bracts erect, equaling or exceeding the inter-

nodes, narrowly subtriangular. INFLORESCENCE simple, subclax, many-flowered, to 28 cm long (! Castellanos), white-lepidote including the petals. FLORAL BRACTS like the upper scape-bracts, exceeding the 12 mm long slender pedicels; flowers suberect. SE-PALS lance-ovate, attenuate, 20-30 mm long, ecarinate, green; petals 4 cm long, red, about equaling stamens, bearing a large truncate scale at base; ovary nearly 1/2 inferior; ovules caudate (?). Pl. I, fig. 19: Flower x 1/2; fig. 20: Sepal x 1.

ARGENTINA: SALTA: Orán: Río Iruya, Limoncito, April 1947, Pierotti s n (LIL 458624, type, US photo), cultivated in Lillo Hortus and illustrated in color.

247a. PITCAIRNIA AUREA Rusby ex L. B. Smith, sp. nov. A P. egleri L. B. Smith, cui affinis, bracteis florigeris pedicellos superantibus, sepalis attenuatis majoribus differt.

PLANT caulescent, flowering 6 dm high; stem repent, at least 12 cm long, appearing 3 cm in diameter because of the covering of old leaf-bases. LEAVES (complete) few and fasciculate at the apex of the stem; sheaths suborbicular, 2 cm long, dark castaneous; blades all persistent, polymorphic, varying by degrees from slender dark spinose-serrate spines to large fully functional ones, the larger linear, attenuate, narrowed toward base but not truly petiolate, to 8 dm long, 20 mm wide, bearing a pale median channel, entire except for the serrate base, completely (?) glabrous. SCAPE erect, slender; scape-bracts erect, attenuate, the lower lanceolate and imbricate, the upper triangular-ovate and shorter than the internodes. INFLORESCENCE simple, lax, many-flowered, finely and laxly pubescent-lepidote. FLORAL BRACTS lanceolate, apiculate, shorter than the pedicels; flowers suberect; pedicels very slender, to 20 mm long. SEPALS lanceolate, attenuate, to 27 mm long, obtusely carinate; petals 6 cm long, golden yellow (! Rusby), bearing a rounded scale at base; ovary ca 1/2 inferior; ovules caudate. Pl. I, fig. 21: Sepal x 1.

BOLIVIA: LA PAZ: on cliff, Bopi River Valley, 900 m, 12 September 1921, Rusby 665 (NY, type, US, photo).

PUYA

PUYA subgenus PUYOPSIS (Baker) L. B. Smith, comb. nov. Pitcairnia subgenus Puyopsis Baker, Handb. Bromel. 91 (with description as "section" in a series of subgenera), 117 (as "subgenus" without description but including the same species numbers as before). 1889. Lectotype. Puya brachystachya (Baker) Mez. (Pitcairnia brachystachya Baker).

Puya subgenus Pitcairniopsis Mez, DC. Mon. Phan. 9: 475. 1896. P. subgenus Pourretia Mez, DC. Mon. 9: 489. 1896. P. subgenus Chagualia Smith & Looser, Revista Universitaria 20: 243. 1935.

Baker distinguished Pitcairnia with septicidal capsules from Puya with loculicidal, and erected the subgenus Puyopsis in Pitcairnia as being technically Pitcairnia but habitally Puya. However, capsule dehiscence has not proven to be a reliable character even at the species level and most of the species that Baker listed under Puyopsis are now Puya as that genus is typified.

Baker further confused the issue by writing "section" when he obviously meant "subgenus" and by including 2 species of true Pitcairnia with red petals under Puyopsis which he described as having: "Flowers white or blue."

However, as the description stands, Puyopsis is the part of Puya other than the subgenus Puya and is the equivalent of Mez's later subgenera Pitcairniopsis and Pourretia combined, or Pitcairniopsis as I amended it. My selection of Puya brachystachya as the lectotype of subgenus Puyopsis is intended to present its simple wholly fertile inflorescence as a maximum contrast to the compound partially sterile one of subgenus Puya.

PUYA COERULEA Lindl. Bot. Reg. 26: pl. 11. 1840.

Gualterio Looser has discovered from field observations that Puya violacea (Brongn.) Mez intergrades with the earlier P. coerulea Lindl. and can not be considered as more than a variety. With his usual modesty he has designated himself as second author of the following necessary combinations:

PUYA COERULEA var. VIOLACEA (Brongn.) Smith & Looser, comb. nov. Pitcairnia violacea Brongn. Ann. Fl. & Pom. III. 1: 116, fig. 1847; Allg. Gartenzeit. 15: 299. 1847. Puya violacea (Brongn.) Mez, DC. Mon. Phan. 9: 476. 1896.

PUYA COERULEA var. MONTEROANA (Smith & Looser) Smith & Looser, comb. nov. Puya violacea var. monteroana Smith & Looser, Revista Universitaria 20: 252, fig. 6. 1935.

PUYA COERULEA var. INTERMEDIA (Smith & Looser) Smith & Looser, comb. nov. Puya violacea var. intermedia Smith & Looser, Revista Universitaria 20: 252, fig. 7. 1935.

KEY TO THE VARIETIES OF P. COERULEA:

1. Floral bracts exceeding the centers of the sepals, ample.
Var. coerulea
1. Floral bracts much exceeded by the sepals or even by the pedicels, rather narrow.
2. Inflorescence glabrous by anthesis.
3. Floral bracts shorter than the pedicels.....Var. violacea
3. Floral bracts exceeding the pedicels.....Var. monteroana
2. Inflorescence densely and persistently white-tomentose.
Var. intermedia.

TILLANDSIA

TILLANDSIA MAGNUSIANA Wittm. Bot. Jahrb. 11: 66. 1901. T. plumosa sensu Mez, DC. Mon. Phan. 9: 735. 1896; L. B. Smith, North American Flora 19: 153. 1938, in part, not as to type. T. plumosa var. magnusiana (Wittm.) Rohweder, Univ. Hamburg, Abh. Geb. Auslandsk. 61, Reihe C, Naturwiss. 18: 80. 1956.

SCAPE almost none. INFLORESCENCE typically 2-flowered. FLO-RAL BRACTS 25-35 mm long, much exceeding the sepals. SEPALS 15-18 mm long; petals 35-40 mm long; stamens exserted.

The leaves of Tillandsia magnusiana and of the earlier T. plumosa Baker are practically indistinguishable, both having

nearly setaceous blades and very fine linear spreading scales. Typical T. plumosa has a distinct scape but in some specimens it is nearly lacking as in T. magnusiana.

Baker described the type and only specimen of his T. plumosa as lacking petals. Mez added a Karwinsky collection to the citation of T. plumosa and undoubtedly on this basis changed the description of the floral bracts from about equaling the sepals to much exceeding them. He also added that the petals were violet, tubular-erect, and shorter than the stamens.

Actually true T. plumosa combines a distinct scape, short floral bracts, and short yellow-green petals that exceed the stamens. All of this was strikingly illustrated by flowering plants in the live collection of Alfred Blass when I visited him in München. Hopefully colored illustrations of the two species will yet be published, but it is necessary to place the correction on record now.

TILLANDSIA SPICULOSA Griseb. Nachr. Ges. Wiss. Goett. "1864": 17. 1865.

This species has certain geographic trends but intermediates are so numerous that it is impossible to maintain T. triticea Burchell ex Baker or T. micrantha Baker as species or T. palmana Mez as even a variety. Thus the following changes are necessary:

TILLANDSIA SPICULOSA var. SPICULOSA. T. brittoniana Baker, Handb. Bromel. 195. 1889. T. palmana Mez, Bot. Jahrb. 30, Beibl. 67: 9. 1901. T. micrantha Baker, Bull. Torrey Bot. Club 29: 698. 1902, non Baker, 1887. T. spiculosa var. palmana (Mez) L. B. Smith, Contr. Gray Herb. 89: 14. 1930.

TILLANDSIA SPICULOSA var. USTULATA (Reitz) L. B. Smith, comb. nov. T. triticea Burchell ex Baker, Journ. Bot. 26: 42. 1888. T. parkeri Baker, Journ. Bot. 26: 42. 1888. T. viridis Baker, Handb. Bromel. 204. 1889. Vriesea luschnathii Mez in Mart. Fl. Bras. 3, pt. 3: 555, pl. 103. 1894. Tillandsia triticea var. ustulata Reitz, Sellowia no. 14: 108. 1962.

TILLANDSIA SPICULOSA var. MICRANTHA (Baker) L. B. Smith, comb. nov. T. micrantha Baker, Journ. Bot. 25: 303. 1887. T. chinchicuana Harms, Notizblatt 10: 578. 1929.

KEY TO THE VARIETIES OF T. SPICULOSA:

1. Floral bracts (5-) 6-9 mm long, mostly more than twice as long as the internodes; spikes densely flowered at least toward apex.
 2. Leaf-blades concolorous or merely spotted; inflorescence usually tripinnate.....Var. spiculosa
 2. Leaf-blades irregularly cross-banded with dark purple; inflorescence usually bipinnate.....Var. ustulata
 1. Floral bracts 4-5 mm long, mostly less than twice as long as the internodes; spikes laxly flowered at maturity.
- Var. micrantha

.....

VRIESEA

VRIESEA HETEROSTACHYS (Baker) L. B. Smith, comb. nov. V. incurvata sensu E. Morr. Belg. Hort. 32: 52, pl. 2. 1882, in part as to Binot s n, non Gaud. 1843. Tillandsia inflata Baker, Bot. Mag. 112: pl. 6882. 1886, in part, as to Binot material and plate, not as to Vriesea inflata Wawra. T. heterostachys Baker, Journ. Bot. 26: 106. April 1888. Vriesea conferta sensu Mez, DC. Mon. Phan. 9: 582. 1896, in part, as to Tillandsia heterostachys Baker, non Gaud. 1843. Vriesea petropolitana L. B. Smith, Arq. Bot. S. Paulo II. 1: 120, pl. 130. 1943. V. x fulgida Hort. Duval, Ill. Hort. 35: 87, pl. 67. December 1888 or later (= V. duvaliana x rostrum-aquilae (= incurvata)).

BRAZIL: Hort. Brussels (BR, clonotype (?) of Vriesea x fulgida). (SAO PAULO:) "southern Brazil", (Le Joly in) Glaziou 13260 in part (B, type, US photo; P, isotype).

The names Tillandsia heterostachys and Vriesea x fulgida are both dated "1888", but only the first has a definite month "April". However, Robert Foster has kindly investigated the copy of Illustration Horticole at Harvard for me and reports that the publication of V. x fulgida could not have been earlier than the end of the year since on page 85 there is a report for December 1888.

VRIESEA VIDALII Smith & Handro, sp. nov. A V. sincorana Mez, cui verisimiliter affinis, spicis densioribus, bracteis florigeris majoribus quam internodiis 4-plo longioribus, sepalis bracteas florigeras paulo superantibus differt.

PLANT flowering 5 dm high. LEAVES rosulate, 3 dm long; sheaths broadly ovate, 10 cm long, covered with fine brown appressed scales; blades ligulate, rounded and apiculate, 5 cm wide, apparently concolorous, subdensely and minutely brown-lepidote on both sides. SCAPE somewhat curved toward apex but not deflexed, exceeding the leaves; scape-bracts erect, the lowest subfoliaceous and densely imbricate, the highest suborbicular, apiculate, red, equaling or slightly exceeding the internodes. INFLORESCENCE few-branched, compact, 11-17 cm long; primary bracts like the upper scape-bracts, equaling to shorter than the short sterile bracteate bases of the spikes; spikes suberect, elliptic, to 8 cm long, 4 cm wide, strongly complanate; rhachis nearly straight, 4-angled. FLORAL BRACTS imbricate but not wholly covering the rhachis, incurved toward apex, ecarinate, 3 cm long, about 4 times as long as the internodes, slightly exceeded by the sepals, thick, probably somewhat fleshy, nearly even when dry, obscurely punctulate-lepidote at apex; flowers not at all secund; pedicels slenderly obconic, 5 mm long. SEPALS narrowly obovate, obtuse and cucullate, 28 mm long, even, brown-lepidote inside; petals-blades elliptic, 10 mm long; stamens exserted. Pl. I, fig. 22: Leaf-apex x 1/2; fig. 23: Inflorescence x 1/2; fig. 24: Sepal x 1.

BRAZIL: RIO DE JANEIRO: Near Abrio (shelter) no. 2, Serra dos Orgãos, Terezópolis, June 1952, José Vidal - II no. 3267 (US type, R isotype).

Plate I

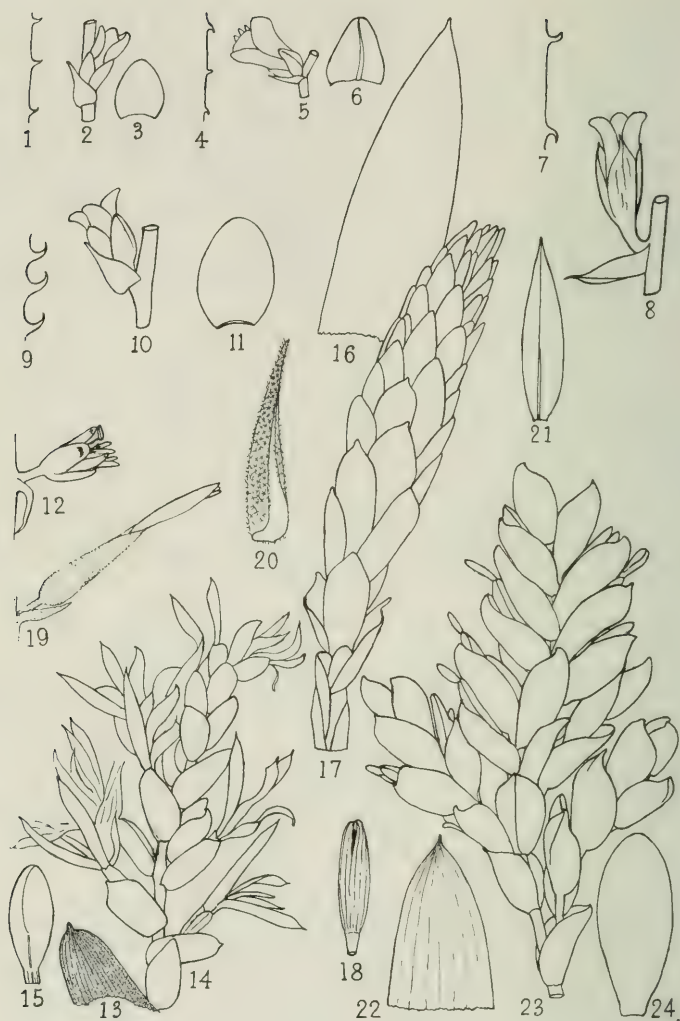


Fig. 1-3: *Dyckia brachyphylla*; 4-6: *D. coximensis*; 7, 8: *D. crocea*; 9-11: *D. platyphylla*; 12: *Encholirium irwinii*; 13-15: *Guzmania filiorum*; 16-18: *G. remyi*; 19-20: *Pitcairnia saltensis*; 21: *P. aurea*; 22-24: *Vriesea vidalii*.

TALAUMA COLOMBIANA SP. NOV.

ELBERT L. LITTLE, JR.

This new tree species, Talauma colombiana (family Magnoliaceae), is based upon a specimen collected in the southern part of Departamento del Huila, Colombia, in 1944.

The genus Talauma Juss. of the family Magnoliaceae has about 40-50 species. Most are in tropical and subtropical Asia, also several in tropical America from southern Mexico and West Indies to eastern Brazil, according to J. E. Dandy (in J. Hutchinson, Gen. Fl. Plants 1: 55. 1964).

Apparently only one species of this genus has been named from Colombia. Published more than a century ago without a specimen, the name is of uncertain application. It was based upon an older description instead of a specimen and seems not to have been identified further. Talauma cespedesii Triana & Planchon (Ann. Sci. Nat. Bot. Sér. 4, 17: 23. 1862), from the province of Bogotá, was known to its authors only from the quoted, earlier description by Cespedes. José Triana and J. E. Planchon explained that in a loose sheet printed in Bogotá about 1840, Cespedes has proposed the generic name Santanderia, in the family Annonaceae. No specific epithet was mentioned. From Cespedes's description, they published the new species, placing it in Talauma and honoring the describer.

This poorly known species is not represented at the United States National Herbarium (US), which has large plant collections from Colombia. That herbarium has only one sheet from Colombia filed doubtfully under Talauma, a sterile specimen from Yarumal, Antioquia. Talauma dixonii Little (Phytologia 18: 457, fig. 11. 1969) was published recently from the Province of Esmeraldas, on the Pacific Coast of northwestern Ecuador, about 300 km. west (slightly south of due west) of the locality of the new species from Huila on the opposite side of the Andes.

The related genus Magnolia L. apparently has not been recorded as native in Colombia. However, M. grandiflora L. from southeastern United States is planted as an ornamental. Three local species are known from the Guayana highlands of Venezuela: M. paritepuiana Steyererm., M. roraimae Steyererm., and M. chimantensis Steyererm. & Maguire. (Material of Talauma, not yet named, has been collected in Venezuela also.) Recently M. striatifolia Little (Phytologia 18: 198, fig. 2. 1969) was described from Esmeraldas, Ecuador, at about Lat. 1° N., the southernmost record of the genus in the New World. Mention of a new species in southern Colombia refers to the following new species of Talauma.

TALAUMA COLOMBIANA Little, sp. nov.

Arbor mediocris sempervirens ad 15 m. alta, trunco 20 cm. diametro. Cortex laevis griseus. Ramuli crassi, statu juvenili pubescentes, demum glabri, nodis annulatis. Stipula perlonga, gemmam longam anguste cylindricam 7 cm. longitudinale 1 cm. diametro obducens, extus adpresso-pubescentia, intus glabrata, ab petiolo libera, caduca. Foliolorum alternorum petioli 1-2 cm. longi, longitudinaliter sulcati, hirsuti, demum glabrati. Laminae lato-ellipticae, 10-18 cm. longae, 8-11 cm. latae, coriaceae, apice rotundatae, basi obtusae, margine parum revolutae, supra virides nitidae glabrae costa impressa puberula atque nervis lateralibus utrinque 15-25 tenuibus parallelis rectis sub angulo c. 70° abeuntibus, subtus dense adpresso-pubescentes pilis fulvis costa prominenti hirsuta.

Fructus aggregatus lignosus nigricans glabratus, carpellis multis concretis c. 2 cm. longis circumscissilibus, stylis acuminatis persistentibus 2-3 mm. longis. Semina 1 vel 2 in loculo, parum triangularia, 7-9 mm. longa, 6-7 mm. lata, 3 mm. crassa, atrocastanea. Flores non visi.

Medium-sized evergreen tree to 15 m. high, with trunk 20 cm. in diameter. Bark smooth, gray. Twigs stout, pubescent when young, becoming glabrous, with ringed nodes. Stipule very long, covering long narrowly cylindric bud to 7 cm. long and 1 cm. in diameter, on the outside appressed pubescent, on the inside glabrate, free from petiole, caducous. Petioles of the alternate leaves 1-2 cm. long, longitudinally grooved, hirsute, becoming glabrate. Blades broadly elliptic, 10-18 cm. long, 8-11 cm. broad, coriaceous, rounded at apex, obtuse at base, slightly revolute at margin, above shiny green and glabrous with impressed puberulent costa and on each side 15-25 slender parallel straight lateral nerves departing at angle about 70°, beneath densely appressed pubescent with yellow-brown hairs and with prominent hirsute costa.

Fruit aggregate, woody, blackish, glabrate, with many crescent carpels about 2 cm. long, circumscissile, with acuminate persistent style 2-3 mm. long. Seeds 1 or 2 in a cell, slightly triangular, 7-9 mm. long, 6-7 mm. broad, 3 mm. thick, dark brown. Flowers not seen.

COLOMBIA, HUILA: Cordillera Oriental, near Río Suaza southwest of Alejandría, alt. 6000 ft., scattered in rich *Quercus* forest, Aug. 24, 1944, E. L. Little, Jr. 8538 (HOLOTYPE, US 2142741 (fruit); also 2143102; unicate mounted on 2 sheets):

Talauma colombiana is a rare, relic species of an ancient, primitive genus. In more than a year of field work in Huila, I found this conspicuous species only once. Notes on its discovery and occurrence follow.

Botanical exploration of the northern Andes was expanded considerably during World War II, because of the wartime procurement program of the Cinchona Division (or Mission) of the Foreign Economic Administration, an agency of the United States Government. There was an urgent need for the anti-malarial quinine and related cinchona alkaloids obtained from the bark of a few species of Cinchona L. (Rubiaceae) native in the upper montane forests of the Andes. This program was well summarized by W. H. Hodge (Wartime Cinchona procurement in Latin America. Econ. Bot. 2: 229-257, illus. 1948). A partial list of the botanists and foresters from the United States who participated was added in a footnote on the first page. Though not listed, I was a botanist with the cinchona surveys in Colombia from November 1943 to April 1945. My field work was mostly in Departamento del Huila, capital Neiva, in the upper Magdalena Valley southwest of Bogotá and bordered by the Cordillera Oriental and Cordillera Central of the Andes. My botanical explorations mostly in the eastern part of Huila extended along Cordillera Oriental, a distance of about 400 kilometers. In the search for Cinchona or "quina," special attention was given to that genus and related Rubiaceae. Also, as time permitted, I made limited collections of tree specimens toward preparation of a list of the trees of Huila.

Talauma colombiana was discovered in a rather inaccessible area at the southernmost part of Huila, approximately Long. 76° 0' W., Lat. 1° 35' N. Geographically it was near the source of Río Suaza and Picos de la Fragua on the northern slope of Cordillera Oriental. Cueva de los Guácheros, a limestone cave near Río Suaza, was a local landmark several kilometers distant. In 1944 the truck road ended at Suaza, about 120 km. by airline south-southwest of Neiva. Southward from Suaza a 2-day trip by horse and pack train led through Acevedo to Alejandría. Field work continued for several days on foot in the vicinity of Cueva de los Guácheros, through the montane forests to the timberline of the divide at an altitude of 2500 m. (8100 ft.), and back. On the last day near Río Suaza at about 1800 m. (6000 ft.), the trail passed through a "rich" or luxuriant oak forest. The dominant species of the montane forest here was an evergreen oak or "roble," Quercus humboldtiana Bonpland (E. L. Little, Jr. 8509; US, COL). In this oak forest were scattered trees of a species not observed elsewhere, a magnolia! The limbs were out of reach, but from the ground along the trail I collected two leafy twigs and a detached fruit, enough for a unicate specimen. The distance on a straight line was perhaps 10-15 km. southwest of the village of Alejandría.

Quercus humboldtiana Bonpland, of Colombia, is the southernmost New World representative of the genus Quercus (oak), one of the most widespread tree genera in the Northern Hemisphere. It is near its southern limit in southern Huila. However, westward it extends perhaps 50 km. farther south in the mountains near Pasto, Nariño, but does not reach Ecuador. This oak is scattered in the mountains and was collected also at the northern end of Huila, northeast of Santa Ana (E. L. Little, Jr. 7319, 7320; US, COL).

Obviously the new species of the magnolia family is rare and local. An evergreen magnolia, especially in flower, would be too conspicuous to be overlooked by botanical collectors. The trees observed may be the survivors of an ancient, nearly extinct line.

It seems appropriate to assign a name to this distinct local species, even though the material is incomplete, lacking flowers. No additional specimens have been noted or named during the 25-year interval. Also, a definite record of the genus Talauma in Colombia can be cited. After a routine identification several years ago, the two sheets of the type collection have been filed under Magnolia grandiflora L., perhaps because of a slight resemblance of the shiny leathery leaves. As preserved, the fruit consists of several outer pieces of carpels with styles, also 3 seeds but no axis. Because the carpels are circumscissile and have split off from an axis, the specimens are referred to Talauma rather than Magnolia. However, as in the latter genus, the stipule of the specimen is free from the petiole and forms no scar on the petiole. In Talauma the stipule commonly is adnate to the upper surface of the adjacent petiole.

Forest Service, United States Department of Agriculture,
Washington, D. C. 20250.

BOOK REVIEWS

Alma L. Moldenke

"ECOLOGICAL ENERGETICS" by John Phillipson, 57 pp., illus.,
Edward Arnold, Publishers, Ltd., London, England. Reprinted
1969.

Appearing first in 1966 and having been reprinted each year since, this book is the Institute of Biology's "Study in Biology No. 1" and has been followed by fourteen other volumes on timely topics. There are a dozen more in preparation. Such series have been popular in America for a couple of decades on campuses, on general library shelves, and in informed readers' pockets.

"With more than two-thirds of the world population undernourished it is of great importance to understand the transformation of solar energy by communities of living organisms, and 'Ecological Energetics' is the study of such transformations."

The "net growth efficiency of bivalve molluscs is higher than that of most vertebrates.....Hardy (1959) has, amongst other things, suggested the use of starfish when removed from oyster beds as poultry food, an excellent idea.....One of the ways of ensuring rational exploitation of a natural resource and guarding against permanent imbalance is to know and understand the pattern of energy flow through the system both before and after man's interference; herein lies the value of ecological energetics."

In between the first quote from the preface and the second from the conclusion of the book, this text deals with the role of energetics in ecosystems, the laws governing energy transformations in nature, trophic-dynamic aspects of food chains and webs, grazer and detritus feeders and their ecological efficiencies, energy flow in animal and plant populations, and the human population explosion with its concomitant increased needs of food.

A small errata slip is wisely bound into the book. It fails to correct the misspelling of "formidable" on p. 17.

The statement "Thus for man to make the maximum use of the solar energy trapped by plants he should become mainly herbivorous" is in no place followed by the realization that man has not been evolved with the gut adaptations of microflora and length found in the rodents and ungulates.

Even though these few pages are crowded with the laboratory and field studies of many modern ecologists the explanations are lucid. There is no index, but the detailed list of contents is an ample substitute. A bibliography of cited works is given.

"PLANT SCIENCE — AN INTRODUCTION TO WORLD CROPS" by Jules Janick, Robert W. Schery, Frank W. Woods & Vernon W. Ruttan, viii & 629 pp., illus., W. H. Freeman & Company, San Francisco, California 94104. 1969. \$12.00.

This book is an excellent addition to the text field because it is much, much more than the usual "cook book" on soil chemistry, agronomy, horticulture and forestry. It stresses the earth as a plant-oriented planet; it expounds effectively biological, biochemical and ecological principles and shows their applications.

Its scope is world-wide, and therefore so is its use wherever English can be used as the medium of instruction. Part I deals with plants and man through crops and world affairs, energetics, food and other human needs, and world population problems. Part II deals with the specific nature of crop plants through their origin, classification, morphology, physiology, development and various methods of reproduction. Part III deals with such environmentally determining factors as light, heat, soil, water, climate and geographic distribution. Part IV deals with strategies of production, such as cropping, nutrition, water management, hazards, and betterment. Part V expounds the industry of plant agriculture in terms of such crops as cereal, legume, forage, root, stem, fruit, nut, extractives, fibers, forest and ornamentals. Part VI deals with the economics of crop production and distribution which in developed parts of the world are truly "big business".

At the end of chapters there are given selected references. The text consistently uses common as well as scientific names for organisms. There is a useful index and an appendix listing conversion tables for temperature, area, length, weight, yield, and volume measures.

This text will be of valuable use in crop science, agronomy, forestry, agricultural economics, horticulture, economic botany and even general botany courses on the collegiate and advanced levels.

"COMMON EDIBLE MUSHROOMS" by Clyde M. Christensen, x & 124 pp., illus., University of Minnesota Press, Minneapolis, Minnesota 55455. 1969. \$4.50 cloth-bound, \$2.45 paper-bound.

This is a safe guide for those consumers "who would a-hunting go" which stresses that learning "to know those that are absolutely safe and good, and avoid all others", and then describes 47 species very clearly. Many are well illustrated in black-and-white and in color plates.

A variety of delicious-upon-reading recipes are given. Pleasantly and safely edible, structurally distinct from any poisonous forms, abundant and widespread throughout North America are the "foolproof four" -- morels, puffballs, sulphur shelves and shaggy manes.

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STUDIES IN THE EUPATORIEAE (COMPOSITAE). XII.

A NEW GENUS, SHINNERZIA

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560

Shinnerzia R.M.King and H.Robinson, genus novum Compositarum (Eupatorieae-Ageratinae). Folia opposita, obovato-spathulata, grosse dentata, basibus longe angustatis connato-amplexicaulibus. Capitula homogama discoidea; involucrum e squamis laxis ca. 12 subtriseriatis, subaequalibus. Receptaculum conicum, nudum. Flores 90-100, omnes hermaphroditi, fertiles, regulares; corolla 5-lobata, superne late campanulata, setifera, inferne valde constricta, glandulifera; loborum cellulis extus et intus projectis. Antherae ad apicem late appendiculatae; collorum cellulis inferne quadratis, leviter annulatis. Styli rami exserti, lineares, superne latiores; superficie valde papillosa. Pappus nullus. Achenia 4-5 costata, parce setifera; cellulis setarum laxis, biseriatis. Carpopodium distinctum, breviter cylindricum; cellulis magnis, plerumque quadratis, parum incrassatis. Pollen valde spinosum.

Species typica: Trichocoronis rivularis A.Gray.

Shinnerzia rivularis(A.Gray) R.M.King and H.Robinson, comb. nov.
Trichocoronis rivularis A.Gray, Mem. Am. Acad. n.s. 4: 66.
1849. [MEXICO: without precise locality, Spring Branch,
Monterey, 28 Jan. 1847, Gregg s.n.(Lectotype GH!)]

Small ascending herb to 40 cm. long, usually unbranched or very sparingly branched. Stems striate, essentially glabrous. Leaves opposite; blades thin, obovate-spathulate, sinuate-incised, grossly dentate, partly dissected, with auriculate wings basally rather palmately veined, with a few appressed white hairs on the upper surface, glabrous beneath, up to 5 cm. long and up to 4 cm. wide. Inflorescence usually monocephalic. Heads 4-5 mm high, 90-100 flowered. Phyllaries in 2-3 series, essentially equal, rather thin to membranous, 25-30, with 3-4 striae, oblong, glabrous, obtuse at the apex. Receptacle convex to conical, warty, without chaff or hair. Corollas broadly campanulate above, sharply constricted below, with glands on the throat and hairs on the limb and backs of the lobes, ca. 2 mm long. Pappus lacking. Achenes prismatic, dark brown when mature, 2.0-2.25 mm long, 4-5 ribbed, ribs setose, setae of lax biseriate cells, apical cells blunt at tip, setae occasionally glandular tipped. Carpopodium large, short cylindric, of large mostly isodiametric rather thin-walled cells, exothecial cells lax and rather isodiametric to

longer than wide. Style branches becoming very broad and flattened, lateral surfaces with crowded long erect cellular projections. Pollen tricolpate, spherical, spinose, ca. 25μ diam. Chromosome number determined as $n = \text{ca. } 30$ (Chambers, unpublished).

Representative specimens examined:

UNITED STATES: Texas: Val Verde Co.: San Felipe Creek, Cory 3570 (GH); San Felipe Springs, Cory 16817 (GH). Del Rio. Chambers 1163 (LL); near Del Rio, Whitehouse 10157 (MICH); Havard 7 (US).

MEXICO: Coahuilla: Muzquiz, Marsh 1073 (F, SMU, TEX). Nuevo León: Ojo de Agua, 4 mi. NE of Sabinas Hidalgo, Rives, Ostos and McCart 8112 (SMU).

It is impossible to continue to treat this species as a member of the genus Trichocoronis. It differs in leaves, shape of the corolla, pubescence of the corolla lobes, pubescence of the achene, structure of the carpodium and in the lack of a pappus. The structure of the hairs on the achene seems to be quite unique. They have lax cells such as usually are found in glands but they have the organization which is characteristic of setae. A few of these hairs have glandular tips, but are not otherwise different in size or structure.

It is with great pleasure that we name this new genus in honor of Dr. Lloyd H. Shinnars of Southern Methodist University. We consider it only appropriate to name this plant which grows in Texas for the dean of Texas botanists.

STUDIES IN THE EUPATORIEAE (COMPOSITAE). XIII.

THE GENUS CONOCLINIUM

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560

Studies of the floral anatomy confirm that Conoclinium is a distinct genus consisting of three species from the United States and Mexico. The genus has been recognized previously by Decandolle (1836) and Small (1903) on the basis of conical receptacle and narrow subimbricate phyllaries. Microscopic examination shows corolla lobes papillose on both the inner and outer surfaces and an anther collar with prominent transverse thickenings in the cell walls. Genera showing these characters include Fleischmannia, Ageratum, and Gyptis. Conoclinium is further distinguished by the primarily glandular indument of the corolla and achene and the blunt tipped apical cells of the pappus setae.

Grant (1953) in his cytological study of the genus Eupatorium found a chromosome number of $n=10$ in Conoclinium coelestinum and stated "The chromosomes of E. coelestinum are extremely small in comparison with the larger chromosomes found in the Verticillata and SUBIMBRICATA which also have a basic number of 10. The chromosomes are $1.0-2.0 \mu$ in length, and as a comparison of fig. 51 and 55 will show, fall in the range of the previous group with a basic number of 17. The chromosomes of E. coelestinum, however, form a third type of chromosome complement." Both C. betonicaefolium (as E. betonicum) (Turner, Powell and King, 1962) and C. greggii (DeJong and Longpre, 1963; Powell and Turner, 1963) have since been recorded as $n = 10$.

Conoclinium DC. Prod. 5:135. 1836.

Sparingly branched herbs; leaves opposite, petioled, blades ovate to deltoid-ovate, crenate to bipinnatifid. Inflorescence in corymbose clusters; heads 50-70 flowered, involucre of ca 25 narrow, usually acute, subimbricate, mostly subequal phyllaries in 2-3 series, receptacle glabrous, conical. Corolla tubular with only slightly narrowed base; outer and inner surface of lobes papillose, papillae of outer surface thick-walled, stomates absent, glands present. Anther collar with elongate cells showing distinct transverse thickenings throughout, exothecial cells mostly quadrate or slightly longer than wide; anther appendage large. Style with a scarcely enlarged basal node with adherant basal sheath; surface cells of stylar appendage densely long projecting. Achene prismatic, glabrous or with a few scattered setae and glands; carpodium not

usually well developed, distinct and asymmetrical in C. greggii; pappus of ca. 30 scabrous setae with enlarged blunt apical cells. Embryo not noticeably sclerotized at lower end. Chromosome number $x = 10$.

Type species; Eupatorium coelestinum L.

Our studies indicate that the genus contains the following three species.

Conoclinium betonicaefolium (Miller) R.M.King & H.Robinson, comb. nov. Eupatorium betonicaefolium Miller, Gard. Dict. ed. 8 Eupatorium no. 9. 1768. Mexico, Texas.

Conoclinium coelestinum (L.) A.P.Decandolle, Prodr. 5: 135. 1836. Eupatorium coelestinum L., Sp. Pl. 836. 1753. E. United States.

Conoclinium greggii (A.Gray) Small, Fl. Southeastern U.S. 1169. 1903. Eupatorium greggii A.Gray, Syn. Fl. N. Am. 1. II: 102. 1884. SW. United States, Mexico.

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STUDIES IN THE EUPATORIEAE (COMPOSITAE). XIV.

ANOTHER EXAMPLE OF DIMORPHIC POLLEN?

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There are, perhaps, no more interesting genera in Mexico than the two very rare and restricted Eupatorieae, Oaxacania B.L. Robins. & Greenm. of southern Mexico and Carterothamnus R.M.King of Baja California. Both genera are shrubby plants found on rocky rather inaccessible bluffs in arid areas. Both genera are known primarily from their original localities. One further point of great interest is that these two genera seem to be very closely related to each other.

Oaxacania and Carterothamnus are readily distinguished from each other by the flattened achene of the former versus the symmetrical achene of the latter, and also by the long stalked glands on the corolla of the former versus the glabrous corolla of the latter. Other differences are also useful for distinction of the two species involved, the obsolete pappus of Oaxacania malvaefolia versus the pappus of numerous scales and one long seta in Carterothamnus anomalochaeta; the thin hardly expanded tips of the style in Oaxacania versus the thick knob like tips in Carterothamnus; the small firm cells forming the collar at the base of the anther in Oaxacania versus the very lax cells of the collar in Carterothamnus. The anther appendages also differ in shape between the two genera, those of Carterothamnus being much shorter and much more markedly truncate, but it must be noted that these appendages do seem very similar in basic structure.

There is one remaining obvious difference that has been observed between material of these two genera. The pollen found within and around the opened anther sacs of Carterothamnus flowers is distinctive in its rather small size, 13-16 μ , and relatively short spines. The pollen in the anther sacs of many collections examined of Oaxacania is unusually large, 25 μ or more, with long spines, ca. 2 μ long. While pollen grains of both of these types may be rather common in other groups of plants, they are rather distinctive when compared with various other Eupatorieae that we have seen. It has seemed rather odd to us that in a microscope slide made from Oaxacania (Pringle 6117), there are a few pollen grains that happen to be essentially like those of Carterothamnus. It seems far more than coincidence that flowers of Carterothamnus that we have examined

showed adherent grains of pollen essentially like those of Oaxacania. These pollen grains are obviously contaminants from other plants, probably brought by various pollinators. Such contamination is commonly observed in the various genera we have examined. The question is, why the contaminants here would be precisely of the rather unusual types that are in each case found in the other of the two related genera. It seems very unlikely that the Hymenoptera of Mexico run a shuttle service between Baja California and Oaxaca, localities over a thousand miles apart.

It would seem a most natural inclination to seize upon this pollen difference as a means of distinguishing the two genera. However, the coincidence of the contamination which we have observed is not the only reason for remaining doubtful. The pollen differences seem almost too great to have become established as characteristic of two such closely related genera. Such differences in pollen size are known in many species where it is associated with polyploidy or heterostyly. Whatever may be the cause, it is our suspicion that examination of a more complete sampling of the populations might show both of the described types of pollen within each genus, Oaxacania and Carterc-thamnus. It is our suspicion that too many similar situations occur where conclusions as to pollen type are based on too restricted a sample.

STUDIES IN THE EUPATORIEAE (COMPOSITAE). XX.

NEW COMBINATIONS IN SPANIOPAPPUS

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Spaniopappus is one of the few genera of Eupatorieae apparently endemic to the West Indies. Fortunately a name is already available for the group since one of the species has a rather distinctive pappus. Here, it is only necessary to recharacterize the genus and add four species that have been described in Eupatorium.

The genus Spaniopappus seems related to Ageratina in the densely papillose inner surface of the corolla lobes, the inornate anther collars, and the large, thin-walled cells of the carpogonium. Spaniopappus is readily distinguished by the papillose backs of the corolla lobes and the less papillose style branches. There is some anatomical resemblance also to Gyptis of South America, but the latter genus has prominent annular thickenings in the anther collars and is more herbaceous with a more compact inflorescence.

Spaniopappus B.L.Robinson, Contr. Gray Herb. n.s. 77: 45. 1962

Laxly branching shrubs; leaves opposite, elliptical, entire or remotely serrulate; petioles slender, sometimes narrowly winged. Inflorescence rather broadly and laxly corymbose; heads 25-60 flowered; involucre of ca. 15 narrow subimbricate phylls in 2-3 series; receptacle essentially glabrous. Flowers about 1 cm high when mature. Corolla tubular; outer surface of lobes toward tip and margins papillose with strongly projecting cells without hairs or glands, without stomates; inner surface of lobes densely papillose with crowded projecting cells, cells of tube mostly narrow with sinuous walls. Anther collar with numerous quadrate cells below, elongate cells above, with little or no ornate thickening on walls; exothecial cells quadrate or slightly longer than wide, anther appendage large; pollen spherical, tricolpate, spinose. Style base glabrous, not or only slightly swollen; surface cells of appendages laxly bulge to nearly smooth. Achene prismatic, usually 5-costate, glabrous or with a few setae; carpogonium distinct but not sharply limited above, with a few rows of large thin-walled rather quadrate cells; pappus of ca. 40 slender setae, only a few show vestiges in one species, persistent, with pointed apical cell. Chromosome numbers not determined.

Type species: Spaniopappus ekmanii B.L.Robinson.

Our studies indicate that the genus contains the following five species.

Spaniopappus ekmanii B.L.Robinson, Contr. Gray Herb. n.s. 77:
45. 1926. Cuba.

Spaniopappus hygrophilus (Alain) R.M.King & H.Robinson, comb.
nov. Eupatorium hygrophilum Alain, Contr. Ocas. Mus. Hist.
Nat. Coleg. "De La Salle" 18: 6. 1960. Cuba.

Spaniopappus iodostylus (B.L.Robinson) R.M.King & H.Robinson,
comb. nov. Eupatorium iodostylum B.L.Robinson, Proc. Amer.
Acad. 47: 194. 1911. Cuba.

Spaniopappus ruckeri (B.L.Robinson) R.M.King & H.Robinson, comb.
nov. Eupatorium ruckeri B.L.Robinson, Contr. Gray Herb.
n.s. 77: 35. 1926. Cuba.

Spaniopappus shaferi (B.L.Robinson) R.M.King & H.Robinson, comb.
nov. Eupatorium shaferi B.L.Robinson, Proc. Amer. Acad.
51: 537. 1916. Cuba.

STUDIES IN THE EUPATORIEAE (COMPOSITAE). XXI.

A NEW GENUS, NEOMIRANDEA

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In the rain forests of Central America and the Northern Andes occur a number of related species of Eupatorieae marked by their fleshy stems and epiphytic habit which we recognize here as a new genus under the name Neomirandea. Due to the taxonomic simplicity of the group, we have included a key and descriptions of two previously undescribed species.

The habit of the plants of this group, one of its most distinctive features, has been subject to comment by many of its collectors. On labels are comments such as "epiphyte", "on tree", or "on stump". One collector, Skutch, went into considerably more detail regarding his N. araliaefolia (no. 316) of Guatemala, "shrub or small tree with branches 25 ft. long and 6 inches in diameter. Epiphytic on an oak tree, 8 ft. above ground, the roots clasping the trunk in the manner of those of a strangling fig, conerescent where touching each other. A single large root descends along the trunk to the ground. Flowers white, rare. More about this interesting plant in my journal under March 4, 1933." It was the epiphytic habit that led Klatt to name one of the species Eupatorium parasiticum. Standley (1938) described his E. brenesii as "Frutex epiphyticus vel interdum terrestris alque scandens, . . ." One species, Neomirandea arthodes, seems somewhat distinct in habit and has been referred to as a "scrambling shrub" or "liane." One other very specialized species, N. angularis, has been referred to as a "small tree, 4 meters tall", "shrub, 10 ft.", or "coarse herb or shrub, 5-8 ft." There is no reference to epiphytic habit in the latter, and it may be an exception in the genus.

Some anatomical features reenforce the overall uniformity of the genus; the smooth to slightly bulging, lax cells of the corolla which are very broad and straight-walled in all but a few species; the short carpopodium with small to rather large thin-walled cells; and especially the very elongate inornate anther collars. Much more striking at the anatomical level is the marked separation of the species into two groups, those with an enlarged stylar node and with hairs inside the corolla, versus those without. Two genera could easily be recognized, but in view of the overall relationship it would serve no purpose. The two groups are treated here as subgenera.

The genus seems to be Ageratinioid. This is evidenced by the often lax-celled carpopodia and the inornate anther collars. The distinct stylar node in some of the species is also indica-

tive. Such relationship is not absolutely clear, however, and some of our conviction rests on the one chromosome count of $n = 17$ for one of the species.

Neomirandea R.M.King & H.Robinson, genus nov.

Plantae suffrutescentes vel subarborescentes plerumque epiphyticae in partibus caulinis et foliariis potius carnosae plerumque glabrae. Folia elliptica vel late cordata integra vel serrata vel eroso-dentata. Inflorescentiae laxae corymbosae. Involucris squamae 10-25 triseriatae valde inaequilongae; receptacula plerumque glabra interdum brevis hirsuta. Flores 5-28 in capitulo; corollae tubulares inferne interdum angustae, lobis extus glanduliferis vel paucisetiferis, faucibus intus interdum hirsutis; filamenta antherarum in parte superiore longa inornata; appendices styli leviter vel non papillatae; achaenia prismatica 5-costata dense setifera vel subglabra; carpodia brevia, cellulis plerumque quadratis, parietibus tenuibus; pappi setiformes plerumque vix scabri.

Type species: Eupatorium araliaefolium Lessing

Chromosome numbers: $n = 17$, $n = 25$.

The genus is named after Dr. Faustino Miranda, the renowned botanist, author of the Flora of Chiapas, and organizer of botanical gardens in Chiapas and the City of México, among other accomplishments.

Key to Species of Neomirandea

1. Hairs on inside surface of corolla; stylar node distinctly enlarged (subg. Neomirandea).
2. Leaves erose-dentate, prominently pubescent beneath N. angularis
2. Leaves serrate or entire, essentially glabrous beneath.
3. Leaves entire; inner phyllaries often laciniate.
4. Heads with ca. 5 flowers; inner phyllaries not reaching tips of flowers; corollas deeply cleft, lobes twice as long as wide, exposing filaments of anthers when recurved N. psoralea
4. Heads with 18-28 flowers; inner phyllaries reaching tips of flowers; corollas with lobes less than half again as long as wide N. araliaefolia
3. Leaves serrate; inner phyllaries not laciniate.
5. Heads with ca. 20 flowers N. hitchcockii
5. Heads with 5-9 flowers N. standleyi
1. Without hairs inside the corolla; without distinct enlarged stylar node (subg. Critoniopsis).
6. Outer phyllaries orbicular, inner phyllaries prominently striate.

7. Heads with ca. 12 flowers; corolla lobes not glandular; leaves long-petiolate; straggling shrub or vine N. arthodes
7. Heads with 20-25 flowers; corolla lobes glandular; leaves short-petiolate; shrub 3-4 m high N. carnosa
6. Outer phyllaries narrow, inner phyllaries not striate.
8. Heads broad with ca. 22 flowers and ca. 18 involucre bracts; tips of pappus setae very slightly winged N. pithecobia
8. Heads narrow with 5-10 flowers and with 10 or less involucre bracts; tips of pappus setae nearly smooth.
9. Heads with 5-6 flowers; backs of corolla lobes covered with prominent large glands.
10. Leaves opposite, lax, usually remotely serrulate or crenulate; cells of corolla laxly quadrate, with straight walls N. parasitica
10. Leaves whorled, small, serrulate in distal half; cells of corolla narrow with sinuous walls N. costaricensis
9. Heads with 9-10 flowers; backs of corolla lobes with glands small or lacking.
11. Leaves ovate, prominently net-veined; achenes scabrous throughout N. ovandensis
11. Leaves narrowly elliptical to oblanceolate, venation obscure; achenes mostly smooth.
12. Leaves acute, short-petiolate N. eximia
12. Leaves obtuse, subsessile N. sciaphila

The genus contains the following 2 subgenera and 13 species.

Subgenus Neomirandea

Corollas with hairs inside; stylar node enlarged; cells of carpogonium small. 5 species.

Neomirandea angularis (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium angulare B.L.Robinson, Contr. Gray Herb. n.s. 96: 19. 1931. E. fistulosum B.L.Robinson, Proc. Bost. Soc. Nat. Hist. 31: 249. 1904. not E. fistulosum Barratt. Costa Rica. Chromosome number n = 25 (Turner & King, 1964).

Neomirandea araliaefolia (Lessing) R.M.King & H.Robinson, comb. nov. Eupatorium araliaefolium Lessing, Linnaea 6: 402. 1831. E. heterolepis B.L.Robinson, Proc. Amer. Acad. 35: 335. 1900. Mexico, C. Amer.

The species seems to occur in two slightly different forms. The typical form which is most common at lower elevations has a more acute base on the leaf blade and scarcely lacinate inner phyllaries. Specimens from Mt. Ovando in Mexico, Guatemala, and western Panama have more abrupt leaf bases and very lacinate

inner phyllaries.

Neomirandea hitchcockii (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium hitchcockii B.L.Robinson, Contr. Gray Herb. n.s. 73: 14. 1924. Ecuador.

Neomirandea psoralea (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium psoraleum B.L.Robinson, Proc. Amer. Acad. 31: 253. 1904. Costa Rica.

Neomirandea standleyi (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium standleyi B.L.Robinson, Contr. Gray Herb. n.s. 77: 40. 1926. E. brenesii Standley, Field Mus. Publ., Bot. 18: 1461. 1938. Costa Rica, Panama.

Subgenus Critoniopsis R.M.King & H.Robinson, subg. nov.

Corollae intus glabrae; styli inferne non nodulosi; cellulae carpodiorum laxae vel indistinctae. 8 species. Type species: Eupatorium carnosum Kuntze.

A few of the species lack the distinctive lax corolla cells and superficially resemble Critonia. When habit information is lacking these species can be distinguished most readily from Critonia by the lax cells of the carpodium.

Neomirandea arthodes (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium arthodes B.L.Robinson, Contr. Gray Herb. n.s. 68: 8. 1923. Costa Rica.

Neomirandea carnosa (Kuntze) R.M.King & H.Robinson, comb. nov. Eupatorium carnosum Kuntze, Rev. Gen. 337. 1891. Costa Rica.

Neomirandea costaricensis R.M.King & H.Robinson, sp. nov.

Frutex terrestris? carnosus. Folia tripliciter verticillata mediocria glabra, petiolo perbreve 4-5 mm longo; laminae late ellipticae vel obovatae 2.5-3.0 cm longae 1.0-1.5 cm latae acutae margine superne remote serrulatae, nervis obscure reticulatis. Involucri squamae triseriatae ca. 9 valde inaequilongae late lanceolatae extus subglabrae; receptacula glabra. Flores 5-6 in capitulo 9-10 mm longi; corollae tubulares, lobis extus dense distincte glanduliferis pauci setiferis, faucibus glabris; styli inferne non nodulosi; achaenia glabra; setae pappi ad apicem vix scabrae.

Chromosome number $n = 17$ (as Eupatorium aff. eximium, Turner & King, 1964).

Costa Rica: Cartago: Cerro de La Muerte. elevation ca. 3000 meters, steep mountain slopes in cloud forest, locally abundant

shrubs 2-3 meters tall, open sun, flowers violet. 24 Aug. 1962.
Robert Merrill King 5389 (holotype US).

A second specimen from a nearby locality shows some characters of the species. Costa Rica: Cartago: Cordillera de Talamanca; Ojo de Agua, 2900-3100 m alt. Shrub with spreading pendulous branches. 8 Nov. 1961. J. Cuatrecasas & J. León 26546 (US). This second specimen is at the elevation characteristic of N. costaricensis and above that of known N. eximia, but in all other characters it is intermediate between the two species and seems to be a hybrid. The intermediate features include flowers 6-8 per head rather than 5-6 or 9-10, backs of the corolla lobes with a few small glands rather than many large glands or none, cells of the corolla laxly oblong and slightly sinuous rather than narrow with sinuous walls or laxly quadrate with straight walls. The hybrid has mostly opposite leaves but has one verticillate-leaved branch.

Neomirandea eximia (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium eximium B.L.Robinson, Contr. Gray Herb. n.s. 73: 11. 1924. Costa Rica.

Neomirandea ovandensis R.M.King & H.Robinson, sp. nov.

Frutex epiphyticus carnosus. Folia opposita majuscula glabra, petiolo breve ca. 1 cm longo; laminae ovatae 10-12 cm longae 3.5-5.0 cm latae acutae margine plerumque remote subserulatae, nervis prominulis reticulato-anastomosantibus. Involucri squamae triseriatae ca. 9 valde inaequilongae anguste lanceolatae extus parce pubescentes; receptacula glabra. Flores 9-10 in capitulo 10-12 mm longi; corollae tubulares, lobis extus paucae minute glanduliferis et setiferis, faucibus glabris; styli inferne non nodulosi; achaenia superne distincte setifera; setae pappi ad apicem vix scabrae.

Mexico: Chiapas: Mt. Ovando, 2000 m, on tree. 14-18 Nov. 1939. E. Matuda 3917 (holotype US).

The type locality, noted for many apparent endemics, is with this species the northernmost locality for the subgenus Critoniopsis. Neomirandea ovandensis is most readily distinguished from its closest relatives by the prominent reticulate venation visible in the dried leaves.

Neomirandea parasitica (Klatt) R.M.King & H.Robinson, comb. nov. Eupatorium parasiticum Klatt, Ann. K. K. Hofmus. Wien 9: 357. 1894. Costa Rica.

Neomirandea pithecoxia (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium pithecoxium B.L.Robinson, Contr. Gray Herb. n.s. 73: 11. 1924. Costa Rica.

Neomirandea sciaphila (B.L.Robinson) R.M.King & H.Robinson, comb.
nov. Eupatorium sciaphilum B.L.Robinson, Contr. Gray Herb.
n.s. 55: 256. 1918. Colombia.

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Southw. Nat. 9: 27-39.

Dentella repens and Hedyotis corymbosa,
new to the United States

Clyde F. Reed*

Dentella repens (L.) Forst. and Hedyotis corymbosa (L.) Lam. (Rubiaceae) are reported below as new to the Flora of the United States. I wish to thank Dr. E.E. Terrell for verifying their identification.

In 1964 the author published an account ** of about 536 species of plants found on the various ore piles in the Ports of Baltimore and Newport News. Since that time many more species have been found on these and other piles in these ports. One of the species found on chrome ore piles at Canton in Baltimore is Dentella repens (L.) Forst. This species is native to India, Malaysia, Polynesia and Australia; it is probably adventive in southern Mexico (Tepic and Guerrero), according to North American Flora, 32(1): 17. 1918.

Dentella repens (L.) Forst., Char. Gen., 25, pl. 3. 1776.
(Genotype of Dentella Forst., 1776).

Syn.: Oldenlandia repens L., Mant., 40. 1767. (Type loc.: India).
Hedyotis repens (L.) Lam., Tab. Encycl., 1: 271. 1791.

Annual, herbaceous, procumbent, rosette arranged, much-branched, the branches slender, obtusely quadrangular, 0.5-0.6 dm long, puberulent, the internodes usually longer than the leaves; stipules broadly deltoid or semiorbicular, about 0.5 mm long, entire and whitish; petioles 1-2 mm long; leaf-blades elliptic or obovate-oblong, 4-10 mm long, 1.5-4 mm wide, obtuse or acute at the apex, obtuse or acute at the base, somewhat succulent, hispidulous or glabrate, white-ciliate, 1-veined; calyx-lobes lance-subulate, attenuate, about 1 mm long; corolla 3-4 mm long; capsule 2.5 mm in diameter, densely white-hispid or sometimes glabrate; seed brownish-black, 0.3-0.5 mm in diameter.

Maryland: Chrome ore piles, Canton, Baltimore. July 9, 1959. Reed 43642; same loc., July 30, 1959. Reed 43832.

Additional specimens were studied in the United States National Herbarium from Mexico, Indochina (Annam), India, China (Hunan), Hainan, Cambodia, New Caledonia, Australia and Philippine Islands.

On a trip to Florida in 1954 the author found another rubiaceous species which seems to be new to the Flora of the United States. It is Hedyotis corymbosa (L.) Lam., which is a cosmopolitan tropical weed. It is reported in the North American Flora (32(1): 19. 1918) from Mexico and the West Indies, but not from continental United States.

Hedyotis corymbosa (L.) Lam., Tab. Encycl., 1: 272. 1791.
(Genotype of *Oldenlandia* L., 1753).

Syn.: *Oldenlandia corymbosa* L., Sp. Pl., 119. 1753. (Type
loc.: Tropical America).

Gerontogea corymbosa Cham. et Schlecht., Linnaea, 4:
154. 1829.

Annual, herbaceous, erect or decumbent, glabrous or nearly so, usually much-branched, the branches slender or stout, 1-5 dm long, obtusely quadrangular; stipules 1-1.5 mm long, whitish, truncate, bearing one or more bristles; leaves sessile or subsessile, the blades linear to linear-lanceolate, 0.8-3.5 cm long, 0.5-5 mm wide, acute to attenuate at the base, deep-green above and usually scaberulous, pale and glabrous beneath, 1-nerved, the margins scaberulous, often subrevolute; flowers in axillary cymes, or rarely solitary, the cymes usually 3-flowered, the peduncles filiform, 5-16 mm long, often recurved, the pedicels longer or shorter than the peduncles; hypanthium less than 1 mm long, the calyx-lobes usually longer, triangular, acuminate; corolla white, short-salverform, equaling or slightly exceeding the calyx-lobes; capsule subglobose, 1.5-2 mm broad and almost as long, bisulcate; seed brown, 0.2-0.3 mm long.

Florida: Glades Co.: open wastes, 8 mi N of La Belle. Dec. 30, 1954. Reed 35559 and 35564; Pinellas Co., weed in lawn, Gulfport. Dec. 31, 1953. R.F.Thorne 13874 (US).

Additional specimens studied in the United States National Herbarium: Central America (Nicaragua, Panama, Mexico, Honduras, El Salvador, Costa Rica); West Indies (Grenada, Guadeloupe, Martinique, Montserrat, Jamaica, Haiti, St. Kitts, St. Croix, Dominica, St. Vincent, Trinidad); South America (Peru, Brazil, Colombia, Venezuela, Curacao, Paraguay, Ecuador, French Guiana, British Guiana, Surinam); Pacific Islands (Guam, Sumatra, Amboina, Philippine Isls.); Asia (Taiwan, China, Indochina (Annam), N. Vietnam (Hanoi), India, Burma); Africa (Uganda, Mozambique, Belgium Congo).

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** Phytologia, 10(5): 321-406. 1964.

BOOK REVIEW
THE GENUS PELEA, WITH PERTINENT AND IMPERTINENT REMARKS

Otto & Isa Degener

Of Pelea the reviewers collected about 225 numbers, with many duplicates for distribution to leading botanical institutions of the world, since 1922. These, with 107 collected by J. F. Rock, 99 by C. N. Forbes, 59 by B. C. Stone, 26 by H. St. John, and a total of about 400 collected by nearly 70 other workers were used by Dr. Benjamin C. Stone for his taxonomic monograph of "The Genus Pelea A. Gray. (Rutaceae: Evodiinae)."

This outstanding work was officially published July 31, 1969 by Dr. Alexander Krebs and copyrighted by J. Cramer in Lehre, near Brunswick (Braunschweig), (West) Germany. Besides the introductory VII pages, 180 additional ones are devoted to the text proper. The paper cover describes the work as containing "77 figures, 9 plates and 22 maps," to us an understatement. The 77 "figures" are actually full-page plates showing the flowering or fruiting twigs of over 40 taxa in addition to pertinent diagrams and dissections. Most of these were executed for Dr. Stone by the late Chinese-American Hung Sun Lau, whom the senior reviewer (a former pupil at the Art Students' League in New York City and Woodstock) had "discovered" and trained while still a schoolboy to illustrate "Plants Hawaii National Park" published in 1930. Mr. Lau's style for the Pelea drawings is the one he had perfected as a youngster almost forty years before. The "9 plates" are full-page half-tones on superior paper of six herbarium specimens and of three photographs of Pelea pallida growing in the forest of the Waianae Range of Oahu. The 22 outline maps, though not so "fancy-looking" because of typed legends, are extremely useful in showing where the different taxa have been collected. Though we know the present price of this 15 mm. thick volume, we do not feel it excessive as the author undertook this study at his "own expense and has not been supported by special grants." That he received no grant-in-aid, that he left the Hawaiian Islands to teach at the University of Malaya in Kuala Lumpur, that he published on a genus comprising 70 endemic Hawaiian and two endemic Marquesan species in Germany and not in the Hawaiian Islands, and that a German publisher was found to print the work in English is a cause for the reader to ponder.

The reviewers, beyond easy, pleasant access to large herbaria and botanical libraries, have depended largely on workers in American and European institutions to collaborate in working up the Hawaiian taxa. Judging the late Dr. Earl E. Sherff to be the most capable taxonomist to bring order out of chaos in Pelea, plants of the genus were sent to him at the Field Museum in Chicago. When unable to borrow the historical collections from Honolulu institutions, Dr. Sherff abandoned the intended study and the Degener

collection, perhaps with some chagrin, was put in moth balls for some more propitious time. When young Mr. Stone showed keen interest in the genus, the accumulation of 225 sheets was put at his disposal and his serious concentration of the group began in 1957. Not wishing to ship coals to Newcastle, almost complete sets of Degener plants have been deposited in the herbaria of the New York Botanical Garden and the University of Massachusetts.

The genus Pelea was established by Asa Gray in 1854 in honor of the temperamental, Hawaiian fire-goddess Pele; and Stone delightfully named two of his six species for the mythical younger sister Hiiaka and for Pele's reluctant lover Lohiau whose unresponsiveness caused his transformation into a pillar of lava. Of L  veill  s (and Faurie's) 14 species, Stone upholds four; and of St. John's (and Hume's) 29, he upholds 11 and relegates 18 to synonymy. Whether Stone, as we suspected on our first meeting, is a more careful worker than the authors of "Plantae novae sandwicensis" (1912) and of "Diagnoses of Hawaiian species of Pelea (Rutaceae)" (1944), only time will tell. Of Hillebrand's ten species he upholds all but one; while of Rock's nine species he upholds seven.

Close relatives of the genus Pelea are Acronychia, Melicope and Euodia (by some spelled Evodia), all belonging to the subtribe Evodiinae. Our genus is not quite endemic the the Hawaiian Archipelago, a few species being known from the Marquesas and perhaps New Caledonia. Though the non-Hawaiian specimens available for Dr. Stone's researches were fragmentary, it is suspected they are more or less ancestral to the phenomenal development of the genus in the Hawaiian Islands. There is, of course, a faint possibility that some seeds of ancient Pelea taxa, evolved in the Islands, reversed the ancient northward emigration and reestablished themselves in the south. Stone describes four Sections: Apocarpa, the most primitive, with carpels free in fruit; while Pelea is the most advanced, with unusually characteristic pollen. Sections Cubicarpa and Megacarpa seem intermediate and tend to overlap with one another.

The presently known distribution of the species is a good example of the narrow endemicity of the Hawaiian flora as a whole: of Kauai's 27 species, 26 are endemic; of Oahu's 22 species, 18 are endemic; of Molokai's 6 species, 1 is endemic; of Lanai's 4 species, 1 is endemic; of Maui's 18 species, 9 are endemic; and of Hawaii's 10 species, 6 are endemic. Noting that of Maui's total of 18 species half occur also on either one, two or rarely three neighbor islands, we judge Maui to be the center of distribution. It would be fascinating to discover why P. clusii-folia s.l., of the Section Pelea, is the only species native to every one of our six major islands. Is this due to its more abundant production of seed or to other factors?

It is truly commendable that German linotypists should have set a technical book of this size in a foreign language with practically no errors. One slip occurs on page 1 where one "Mauna Kea" must be replaced by "Mauna Loa". Regarding scientific-

ic plant names we prefer and here make, in spite of the author's attitude expressed on page 137, the following orthographic changes recommended by the International Code of Botanical Nomenclature. Most of these changes do not alter the name of the original authors:

Pelea kauaiensis Mann (1866) became Drake's Evodia kavaiensis (1890). Stone (1969) calls the taxon in casual observation P. kavaiensis on page 153; but in his geographical distribution on page 13 and in his index on page 177, P. kauaiensis. Mann's specimen is of course from the Island of Kauai. Whether the binomial P. kauaiensis is a valid one or not, it is used extensively in botanical literature as, for example, in Rock's Indig. Trees Haw. Islands (1913), in Hillebrand's Flora Haw. Islands (1888) as well as in a recent photolithograph edition of the latter now on the market, and in Stone's monograph. The writers have been long upset by the publication of Pelea kauaensis St. John in 1944 because of St. John's spelling being identical except for the lack of one letter to Mann's P. kauaiensis, and herewith invoke Article 75 of the Code. This reads: "When two or more generic names (or specific epithets) are so similar that they are likely to be confused, because they are applied to related taxa or for any other reason, they are to be treated as variants, which are homonyms when they are based on different types." We choose to name this rare Oahu plant in honor of the monographer:

PELEA STONEI Deg. & Deg., nom. nov.

Syn. P. kauaensis St. John in Lloydia 7: 269. 1944.

Regarding this species we wish to correct and emend Dr. Stone's account on page 114. The type was collected on the mountain Kaua, the origin of St. John's specific name, by the late Miss Amy Suehiro, the senior reviewer's Botany student at the University of Hawaii in 1925-26. Until her recent passing, she was one of the entomologists at the Bishop Museum. Puu Kaua is part of the old Waianae (not "Waiamae") Range of Oahu, covered at the base by ancient lava flows from the Koolau Range and thus proving the two ranges' respective ages. The only other specimen of this species presently known was collected by Degener & Ordonez at Kawailoa in the Koolau Range, July 3, 1938 (not "1908").

Similarly noting Articles 64 and 75 of the Code, we find it deplorable that P. kaalae Wawra in Flora 56: 110. 1873 makes P. kaalaensis St. John in Lloydia 7: 238. 1944, standing for an entirely different taxon, untenable. Hence we here publish for P. kaalaensis St. John the following new binomial:

PELEA SHERFFII Deg. & Deg., nom. nov.,

in honor of the late Dr. E. E. Sherff who had intended to monograph the genus Pelea as early as 1934.

The Kauai endemic P. anisata Mann, described on pages 121-123, is the outstanding species of the entire genus in ancient folklore and even today, a subject for Ethnobotany beyond the scope of this review. The plant's fame is based on the abundant pres-

ence of anethole which imparts to it a "characteristic anise" (Stone page 27) fragrance. The capsules since time immemorial have been strung into lei, or garlands, which increase in their perfume for some time with age. Quite a number of individuals, we warn, are allergic to the wearing of mokihana garlands, suffering a rash where the capsules touch the skin. As the zeal for gathering these fruits threatened the extinction of the species, it is now forbidden to pick them.*

Fascinated in studying a monograph such as this, the reviewers are nevertheless duty-bound to engage in a certain amount of "nit-picking" drudgery deserving record in print:

"Pelea balloui Rock," incorrectly copied in Stone's monograph, is spelled Pelea balloui by Rock in his Indig. Trees Haw. Isl. 228. 1913. The species was named in honor of Prof. Howard M. Ballou, not for "Balloui".

Though the orthography of P. clusiaefolia A. Gray in U. S. Expl. Exped., Bot. 15 (1): 340. 1854 has been corrected, according to Rec. 73G (c) of the Code, by such workers as Selling and Skottsberg to P. clusiifolia, a swarm of trivial taxa still remain to be corrected: 1.) P. clusiaefolia subsp. cookeana (Rock) Stone in Bishop Mus. Occ. Pap. 23 (10): 149. 1966 to P. clusiifolia subsp. cookeana nobis emend., according to Rec. 73G (c) as do all the following names: 2.) P. clusiaefolia subsp. cookeana f. longipes Stone ibid. p. 158 to P. clusiifolia subsp. c. f. l. 3.) P. clusiaefolia subsp. dumosa (Rock) Stone ibid. p. 149 to P. clusiifolia subsp. d. 4.) P. clusiaefolia subsp. sapotaefolia (Mamm) Stone ibid. p. 149 to P. clusiifolia subsp. sapotifolia. 5.) P. clusiaefolia subsp. sapotaefolia f. sapotaefolia Stone in Genus Pelea A. Gray 154. 1969 to P. clusiifolia subsp. sapotifolia f. sapotifolia. 6.) P. clusiaefolia subsp. sapotaefolia f. puberula Stone in Bishop Mus. Occ. Pap. 23 (10): 149. 1966 to P. clusiifolia subsp. sapotifolia f. p. 7.) P. clusiaefolia var. auriculifolia (A. Gray) Stone in Genus Pelea A. Gray 155. 1969 to P. clusiifolia var. auriculifolia. 8.) P. clusiaefolia var. crassiloba Stone in Bishop Mus. Occ. Pap. 23 (10): 157. 1966 to P. clusiifolia var. c. 9.) P. clusiaefolia var. crassiloba f. degeneri Stone ibid. p. 158 to P. clusiifolia var. c. f. d. 10.) P. clusiaefolia var. cuneata St. John & Hume in Lloydia 7: 265. 1944 to P. clusiifolia var. c. 11.) P. clusiaefolia var. cuneata f. aurea Stone in Bishop Mus. Occ. Pap. 23 (10): 158. 1966 to P. clusiifolia var. c. f. a. Stone's actual spelling in his monograph (p. 149) is "clusaefolia". 12.) P. clusiaefolia var. ecuneata St. John in Lloydia 7: 265. 1944 to P. clusiifolia var. e. 13.) P. clusiaefolia var. fauriei (Léveillé) St. John & Hume ibid. p. 265 to P. clusiifolia var. f., and 14.) P. clusiaefolia var. pickeringii (St. John) Stone in Bishop Mus. Occ. Pap. 23 (10): 148. 1966 to P. clusiifolia var. p. Stone's actual spelling, as before,

is "clusaefolia." The alternate of the vernacular name of P. clusiifolia (p. 137) is kukaimoa, or "chicken dropping," probably in allusion to the fanciful appearance of the dried capsules. This name does not appear on page 180.

15.) P. haleakalae Stone in Bishop Mus. Occ. Pap. 23 (10): 158. 1966 to P. haleakalana nobis emend., according to Rec. 73D. 16.) Regarding P. lydgatei Hillebr., Dr. Stone erred on page 50 regarding the information given him. The man was John Lidgate originally, later spelling his name "Lydgate." 17.) P. macropus Hillebr. Fl. Haw. Isl. 65. 1888 owes its trivial name to the fact that "The thickening of the pedicel, already considerable in the bud, increases after the lapse of the flowers, and attains a diameter of 1 1/2" when the capsule matures." The spelling P. marcopus (p. 13) is obviously one of the few typographical errors. 18.) P. makahae Stone in Pac. Sci. 17: 410. 1963 to P. makahaensis according to Rec. 73D. 19.) P. munroii St. John in Lloydia 7: 269. 1944 to P. munroi according to Rec. 73C (a). 20.) P. nealae Stone in Deg. Fl. Haw. Fam. 179, Dec. 28, 1960 to P. nealiae according to Rec. 73C sub (d). See also Note 5 of the Code where, for example, it is stated that Berberis wilsonae should be corrected to B. wilsoniae. 21.) P. pseudoanisata Rock is mentioned by Stone (p. 103) as being "endemic to the Kohala Mountains of Hawaii." If his citation of Degener 21798 collected "Near Kulani Road, 4000', 5 Feb. 1952" is indeed this species, the range extends far beyond Kohala. 22.) Regarding P. sandwicensis (H. & A.) A. Gray, first discovered by Lay & Collie on Oahu in 1826 and mentioned by Stone on page 58, Otto Degener (No. 8575) collected apparently the same species on Molokai in 1928. His plant was a very twiggy tree. The Degeners revisited the precise locality at 2,000 feet elevation Jan. 15, 1960 without finding a trace of the historical tree nor any seedlings. The area, surrounding the now abandoned pigeon-pea field, is a dense, dryish forest. 23.) P. volcanica var. kohalae Stone in Bishop Mus. Occ. Pap. 23 (10): 160. 1966 to P. v. var. kohalaensis according to Rec. 73D. 24.) P. waialealae Wawra in Flora 56: 108. 1873 to P. waialealeana according to the same recommendation which likewise applies to the remaining two taxa: 25.) P. waialealae var. latoi St. John & Hume in Lloydia 7: 267. 1944 to P. waialealeana var. l. 26.) P. waialealae var. pubescens Skottsb. in Acta Horti Gotob. 15: 383. 1944 to P. waialealeana var. p. 27.) P. wawraeana Rock in adjective form according to Rec. 73C (d) and 73D. Thus far we have never heard a single student in the Hawaiian Islands pronounce Henry (Heinrich) Wawra's name correctly. It is not pronounced as it is written, but as though it were spelled "Vavra". Dr. Rock, who told the reviewers that his ancestry was Austrian and Hungarian, named this Pelea in honor of his Austrian "Compatriot."

Mauka and uka connected with place names usually of well-known desert regions refer to inland or upland areas and thus,

most probably, subject from moderate to heavy fogs or rains. Hence the reader must not assume the plants collected there are xerophytes. "Humblotidendeon" (p. 37) and "Humblotidendron" (pp. 6 & 164) are self-evident misprints. "Wuatila 'B'" (p. 134) connected with Degener & Park 8503 is probably a misreading of Degener's India ink scribble on a sheet deposited in distant Berlin or New York. Dr. Stone's reference to "Otto Degener" should be corrected to refer since 1953 likewise to Mrs. Degener (née Isa Irmgard Hansen, whose doctorate thesis was based on the genus Erica). "Donagho" (p. 143) refers to the late John Donaghho, Prof. of Mathematics and colleague first of Rock at the College of Hawaii and later of the senior reviewer at the renamed University of Hawaii. "Oliveira, J. (Mrs.)" (p. 172) stands for Mrs. Chester K. Wentworth (née Juliette Oliveira), sister-in-law of F. R. Fosberg. Urata (p. 174) stands for geneticist Rokuro Urata, the senior reviewer's former student; or perhaps for his son, a macadamia specialist.

We should like to quote (p. 2) Dr. Stone's sage words: "- - - the concept that the Hawaiian species were notoriously variable and confusing but relatively few, which to some extent guided systematists of the last century, has been shown to be for the most part, erroneous." The senior reviewer for years has estimated the number of describable endemic taxa at about twenty times the commonly accepted number. This huge flora owes its existence largely to isolation on different islands and on adaptation to particular ecological niches. Since the coming of Captain Cook and the naturalization of Occidental and Oriental taxa of man with their exotic herbivorous animals, their cultivated and naturalized plants, and their bulldozers many of these peculiar niches with their individual peculiar biota are rapidly disappearing.

As Stone does not list in his monograph the collections chronologically which he studied, we have made only a half-hearted estimate regarding possible extinction of Pelea taxa. Thus of about 100, one has not been found since 1860, five others not since 1870, two others not since 1910, nine others not since 1920, fifteen others not since 1930, and six others not since 1940. Many of the taxa, even some of those collected during the last fifty years, are known from only one or two trees, like Pearsall's find of P. makahaensis Stone in 1954. Of course later botanizing may turn up some of such "lost" taxa and even some new to Science, yet about half of Pelea taxa known from the Hawaiian Islands have not been collected since 1940 and are presumed extinct! For the "practical" individual who does not care beans whether a plant creation has been lost or not, he should realize that a germ-pool is gone forever that had the ability to produce complex ethereal oils, proteins and other substances for too complicated and/or costly for the wisest chemist to duplicate. How many of these had potential value in medicine and industry?

Similar statistics apply to other native genera. This holocaust of the native Hawaiian biota in less than two centuries is

a horrible condemnation of our "Civilization!" Dr. Stone's excellent monograph of the genus Pelea, like so many similar monographs, shows what the Hawaiian flora USED TO BE, certainly not what it is NOW.

*Activities of the public on forest reserve lands are subject to various regulations approved November 24, 1941 by the Governor of Hawaii. Section 1 (a) forbids "The cutting, killing, destroying, injuring, or otherwise damaging- - - - - vegetation, except as authorized by permission from the State Forester or his agent." The penalty for a violation is a fine not exceeding \$500. Permits to pick mokihana (P. anisata) capsules, according to a personal communication dated November 18, 1969 from District Forester R. E. Daehler, now may be issued or denied depending on the location of the plants and the purpose of the picking. Commercial picking is strictly forbidden, or kapu. As mokihana is a tolerant species, attempts are now being made to establish it as an understory in forests planted to exotic trees.

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A NEW COMBINATION IN DIOSTEA AND A NEW VARIETY OF LIPPIA

Harold N. Moldenke

DIOSTEA SCOPARIA var. PUBERULA (Troncoso) Moldenke, comb. nov.

Verbena scoparia var. puberula Troncoso in Böcher, Hjerting, & Rahn, Dansk Bot. Arkiv 22 (1): 109--110. 1963.

LIPPIA ELEGANS var. OBTUSIFOLIA Moldenke, var. nov.

Haec varietas a forma typica speciei laminis foliorum ad apicem valde obtusis vel rotundatis recedit.

This variety differs from the typical form of the species in having the apex of the leaf-blades very conspicuously obtuse or rounded.

The type of the variety was collected by Graziela Maciel Barrosa, M. José Lima, & Ana Lima (no. 568) in rocky places at Chapada dos Veadeiros, at 1800 meters altitude, Goiás, Brazil, on December 21, 1968, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collectors describe the plant as "Arbusto ramificado com flores alvas".

ADDITIONAL NOTES ON THE ERIOCAULACEAE. XXVII

Harold N. Moldenke

ERIOCAULACEAE Lindl.

Additional & emended bibliography: Lam., *Encycl. Méth. Bot.* 3: 275—276. 1789; R. Br., *Prodr. Fl. Nov. Holl.*, pr. 1, 1: 252—255 (1819) and pr. 2, [Isis 1819:] 47—48. 1819; Mart., *Nov. Act. Acad. Leopold.-carol. Nat. Cur.* 17 (1): 1—72, pl. 1—3. 1835; Guill. in Deless., *Icon. Pl. Sel.* 3: 57—61 & 67, pl. 95—98. 1837; Mart., *Flora 24, Beih.* 2: 58 & 60. 1841; Benth. in Hook. f., *Niger Fl.* 547—548 & 582. 1849; C. Müll. in Walp., *Ann.* 6: 1170—1171, 1203, & 1245. 1861; Schweinf., *Beitr. Fl. Aethiop.* 295 & 309. 1867; Sauv., *Anal. Acad. Ci. Habana* 7: 715—717 (1871) and 8: 48—50. 1871; Sauv., *Fl. Cub.* 161—165. 1871; Benth. & Hook. f., *Gen. Pl.* 3 (2): 1018—1025, 1238, 1239, 1244—1246, 1249, 1250, 1252, & 1254—1256. 1883; Wawra, *Itin. Princ. Saxo-Coburg.* 2: 96—97, pl. 12. 1888; Ruhl. in Engl., *Bot. Jahrb.* 27: [65]—85. 1899; N. L. Britton, *Man.*, pr. 1, 236—238, 1067, 1068, & 1078 (1901) and pr. 2, 236—238, 1067, 1068, & 1078. 1902; J. K. Small, *Fl. Southeast. U. S.*, ed. 1, 231, 234—236, 1328, 1353, 1358, 1361, 1368, 1382, 1383, 1385, 1388, & 1392. 1903; Usteri, *Beitr. Kenntn. Philip. Veg.* 131. 1905; N. L. Britton, *Man.*, pr. 3, 236—238, 1067, 1068, & 1078 (1905) and pr. 4, 236—238, 1067, 1068, & 1078. 1907; H. Lecomte, *Journ. de Bot.* 21 [sér. 2, 1]: 86—94, [101]—109, & [129]—136, fig. 1—3. 1908; J. K. Small, *Fl. Southeast. U. S.*, ed. 2, 231, 234—236, 1328, 1353, 1358, 1361, 1368, 1382, 1383, 1385, 1388, & 1392. 1913; Britton & Br., *Illustr. Fl.*, ed. 2, pr. 1, 1: xxiii, 453—456, & [678]—680, fig. 1140—1145 (1913) and 3: 574, 575, 581, 597, & 625. 1913; Alv. Silv., *Arch. Jard. Bot. Rio Jan.* 2: 7—8, pl. 1 & 2. 1918; Alv. Silv., *Arch. Mus. Nac. [Brazil]* 23: 159—171, pl. 1—5. 1921; Saunders, *Ann. Bot.* 39: 158. 1925; Haines, *Bot. Bihar & Oris.* 1: 80. 1925; H. N. Ridl., *Fl. Mal. Penins.* 5: 133—136, fig. 218. 1925; Stapf, *Ind. Lond.* 4: 22 & 67. 1930; Ruhl. in Engl. & Prantl, *Nat. Pflanzenfam.*, ed. 2, 15a: 39—57, 695—698, 700—702, & 704, fig. 16—25. 1930; Steinberg in Komarov & Schischkin, *Fl. U. S. S. R.* 3: 494—498 & 748, pl. 27, fig. 1—5. 1935; Britton & Br., *Illustr. Fl.*, ed. 2, pr. 2, 1: xxiii, 453—456, & [678]—680, fig. 1140—1145 (1936) and 3: 574, 575, 581, 597, & 625. 1936; Worsdell, *Ind. Lond. Suppl.* 2: 28 & 38. 1941; Moldenke in Lundell, *Fl. Texas* 3, pr. 1, 1—9. 1942; Britton & Br., *Illustr. Fl.*, ed. 2, pr. 3, 1: xxiii, 453—456, & [678]—680, fig. 1140—1145 (1943) and 3: 574, 575, 581, 597, & 625. 1943; León, *Fl. Cub.* 1: 278—284 & 426. 1946; Britton & Br., *Illustr. Fl.*, ed. 2, pr. 4, 1: xxiii, 453—456, & [678]—680, fig. 1140—1145 (1947) and 3: 574, 575, 581, 597, & 625. 1947; H. Hess, *Bericht. Schweiz. Bot. Gesell.* 65: 115—204 & 263—271. 1955; F. Herman, *Fl. Nord & Mitteleur.* 215—216. 1956; Hedberg, *Symb. Bot. Upsal.* 15 (1): 60—61 & 263. 1957;

Moldenke, Bot. Mus. Leaflet. Harvard Univ. 18: 124. 1958; Van Royen, Nov. Guin., new ser., 10: [21]—44, fig. 1—5 (1959) and 10: 236. 1960; G. S. Puri, Indian For. Ecol. 1: 293. 1960; Moldenke in Lundell, Fl. Texas 3, pr. 2, 3—9, 415, & 425. 1961; J. D. Montgomery, N. J. Nat. News 18: 122. 1963; Moldenke, Bol. Soc. Venez. Cienc. Nat. 23: 300—301. 1963; Anon., Biol. Abstr. 46: 2131. 1965; Sandoval, Biol. Abstr. 46: 2128. 1965; Van Royen, Nov. Guin. Bot. 14: 467. 1965; Datta & Majumdar, Bull. Bot. Soc. Bengal 20: 38—39. 1966; Anon., Biol. Abstr. 48: 3190. 1967; Dandy, Reg. Veg. 51: 38, 48, & 96. 1967; Tingle, Check List Hong Kong Pl. 54. 1967; M. Sharma, Agra Univ. Journ. Res. Sci. 16: 43—47. 1967; Ellis, Swaminathan, & Chandrabose, Bull. Bot. Surv. India 9: 15. 1967; Joseph & Vajravelu, Bull. Bot. Surv. India 9: 29. 1967; S. K. Jain, Bull. Bot. Surv. India 9: 75—76. 1967; Rao & Kumari, Bull. Bot. Surv. India 9: 110. 1967; Sebastine & Vivekanathan, Bull. Bot. Surv. India 9: 165 & 183. 1967; J. Hutchinson, Keys Fam. Flow. Pl., rev. ed., 104. 1967; Subba Rao & Kumari, Bull. Bot. Surv. India 9: 188—189. 1967; Sebastine & Ellis, Bull. Bot. Surv. India 9: 199. 1967; Kammathy, Rao, & Rao, Bull. Bot. Surv. India 9: 207 & 232—233. 1967; Panigr. & Saran, Bull. Bot. Surv. India 9: 260. 1967; MacKeever, Native & Naturl. Pl. Nantucket 43. 1968; Anon., Dict. Cat. Nat. Agric. Lib. 21: 229. 1968; Wardlaw, Morphogen. 48 & 49, fig. F. 1968; Van Donselaar, Meded. Bot. Mus. Rijksuniv. Utrecht 306: 397 & 402. 1968; Vajravelu, Joseph, & Chandr., Bull. Bot. Surv. India 10: 81. 1968; Inamdar, Bull. Bot. Surv. India 10: 131. 1968; J. L. Ellis, Bull. Bot. Surv. India 10: 159. 1968; Cannon & Bangerter, Proc. Bot. Soc. Brit. Isles 7: 370. 1968; Arora, Bull. Bot. Surv. India 10: 65. 1968; Moldenke, Biol. Abstr. 50: 4149, 6336, 7436, 7996, & 10282. 1969; Jeffrey & Takhtajan, Flow. Pl. 238, 247, 251, & 293. 1969; Marxmüller, Assoc. Etud. Tax. Fl. Afr. Trop. Bull. 20 [Mitt. Bot. Staatssam. Münch. 3]: 26. 1969; G. W. Prescott, How to Know Aquat. Pl. 133, 134, 137, & 164, fig. 146. 1969; Anon., Biol. Abstr. 50: 8564 (1969), 50 (8): BASIC S.64, 141, 149, & 186 (1969), 50 (12): BASIC S.69 (1969), 50 (15): BASIC S.70 (1969), and 50 (19): BASIC S.68 & 194. 1969; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1968: 24—25. 1969; M. A. Rau, Bull. Bot. Surv. India 10, Suppl. 2: 84. 1969; Hansen & Rahn, Dansk Bot. Ark. 22: 28, 31, 35, 39, & 42. 1969; Lehr, Bull. Torr. Bot. Club 96: 721. 1969; Moldenke, Phytologia 19: 5—46 & 65—109 (1969) and 19: 230—250. 1970.

The name for the order to which this family belongs is spelled "Eriocaulales" in Cronquist, Evol. & Class. Flow. Pl. 335 (1968).

It should be noted here that the Sauvalle, Fl. Cub. reference given in the bibliography above is often cited as "1868", but, according to the late Dr. J. H. Barnhart, the portion of the work involved here was not actually published until 1871.

Hutchinson (1967) describes the Eriocaulaceae as "Flowers unisexual, monoecious, crowded into small heads; inner perianth-segments often united; ovule solitary, pendulous; perennials or rarely annuals".

BLASTOCAULON Ruhl.

Additional bibliography: Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 40, 41, 46, 48, 52, & 53, fig. 20. 1930; Moldenke, Alph. List Cit. 2: 460 (1948) and 3: 731. 1949; Moldenke, Phytologia 19: 7. 1969; Moldenke, Biol. Abstr. 50: 4149, 7436, & 7996. 1969.

BLASTOCAULON ALBIDUM (Gardn.) Ruhl.

Additional synonymy: Philodice albida Benth. & Hook. f. apud Ruhl. in Engl., Pflanzenreich 13 (4-30): 225, in syn. 1903.

Additional bibliography: Benth. & Hook. f., Gen. Pl. 3 (2): 1023 & 1024. 1883; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 53. 1930; Moldenke, Phytologia 19: 7. 1969.

The combination, Philodice albida, does not actually occur in the Bentham & Hooker reference cited by Ruhl. (1903). The combination is only partially suggested there. Bentham & Hooker's actual statement under the genus Philodice is "Genus Paepalantho valde affine, nec habitu nec floribus foemineis a speciebus nonnullis generis istius polymorphi distinguendum. Kornicke genus retinuit ad species 2 limitatum floribus ♂ 2-andris in periantho 3-mero, nobis melius definitum videtur si includimus Paepalanthum albidum et P. rupestrem, Gardn. in Hook. Pl. t. 525, floribus ♂ 3-andris, antheris tamen apertis 1-ocularibus".

BLASTOCAULON PROSTRATUM (Körn.) Ruhl.

Additional bibliography: Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 40 & 53. 1930; Moldenke, Phytologia 18: 242—243. 1969.

BLASTOCAULON RUPESTRE (Gardn.) Ruhl.

Additional bibliography: Benth. & Hook. f., Gen. Pl. 3 (2): 1023 & 1024. 1883; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 52 & 53, fig. 20. 1930; Moldenke, Alph. List Cit. 2: 460 (1948) and 3: 731. 1949; Moldenke, Phytologia 19: 7. 1969.

COMANTHERA L. B. Sm.

Additional bibliography: Moldenke, Phytologia 19: 8. 1969; Moldenke, Biol. Abstr. 50: 4149. 1969.

ERIOCAULON ABYSSINICUM Hochst.

Additional bibliography: Schweinf., Beitr. Fl. Aethiop. 295. 1867; Ruhl. in Engl., Bot. Jahrb. 27: 67, 72, 83, & 84. 1899; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 160, 165—167, & 270, fig. 2 & 3, pl. 9, fig. 8 & 9. 1955; Moldenke, Phytologia 19: 12 & 42. 1969; Moldenke, Biol. Abstr. 50: 4149 & 6336. 1969.

ERIOCAULON ACHITON Körn.

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 68. 1899; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 49. 1930; Moldenke, Phytologia 19: 12—13, 42, 44, 85, & 91. 1969;

Moldenke, Biol. Abstr. 50: 7436. 1969; Moldenke, Phytologia 19: 245 & 246. 1970.

ERIOCAULON AFRICANUM Hochst.

Additional & emended bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 67, 70, & 77. 1899; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 49. 1930; Moldenke, Alph. List Cit. 3: 700 (1949) and 4: 1014. 1949; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 266—269, fig. 1 & 5. 1955; Moldenke, Phytologia 19: 13. 1969.

For a detailed discussion of the relationships of this taxon see under E. tofieldifolium Schinz in these notes.

ERIOCAULON AFZELIANUM Wikstr.

Additional bibliography: Körn. in Miq., Prol. Fl. Iap. 328. 1867; Ruhl. in Engl., Bot. Jahrb. 27: 72 & 82. 1899; Moldenke, Phytologia 19: 13. 1969.

ERIOCAULON ALPESTRE Hook. f. & Thoms.

Additional synonymy: Eriocaulon alpestre a typicum Maxim., Diagn. Pl. Nov. Asiat. 8: 24. 1893.

Additional & emended bibliography: Maxim., Diagn. Pl. Nov. Asiat. 8: 7, 16, 20, 21, & 23—27. 1893; Moldenke, Alph. List Cit. 2: 461 (1948) and 4: 998 & 1202. 1949; Moldenke, Phytologia 19: 14, 19, 20, & 90 (1969) and 19: 239, 244, & 246. 1970.

Maximowicz (1893) separated what he regarded as typical E. alpestre from what is now called E. robustius (Maxim.) Mak. by giving the essential characters of the typical E. alpestre as "folia angusta (1,5—2,5 mm. lata) et pauciora scapis 3- (4-) costatis parum v. duplo breviora, capitula minora 10—15-flora", while for E. robustius he says "Folia latiora (3—7 mm.) et numerosiora scapis 4—5-costatis parum breviora, capitula non-nihil majora 20—50-flora".

ERIOCAULON ALPINUM Van Royen

Additional bibliography: Moldenke, Phytologia 19: 65 & 84. 1969.

This species has been collected at altitudes of 8000 to 11,000 feet, flowering and fruiting in August. Mrs. Clemens found it growing in boggy meadows and wet pools. Brass notes that it is "very abundant and sometimes completely covering boggy ground", while he and Meyer-Drees found it growing "in large cushions on marshy slopes".

ERIOCAULON ANGUSTIFOLIUM Körn.

Additional bibliography: Van Royen, Nov. Guin., new ser., 10: 37 & 44. 1959; Moldenke, Phytologia 19: 15. 1969.

ERIOCAULON ANNAMENSE H. Lecomte

Additional & emended bibliography: H. Lecomte, Not. Syst. 2: 215 & 216 (1912) and 2: 393. 1913; Moldenke, Phytologia 19: 16. 1969.

ERIOCAULON ANTUNESII Engl. & Ruhl.

Additional & emended bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 70 & 76--77. 1899; Moldenke, Phytologia 19: 16. 1969.

The collector cited in a previous installment of these notes as "Winkony" should have been "Winkoun". For additional notes on this species see under E. malaissei Moldenke.

ERIOCAULON ARECHAVALETAE Herter

Emended synonymy: Eriocaulon latifolium Arech., Anal. Mus. Montev. 4 (1): 21. 1902 [not E. latifolium Bong., 1831, nor Nees, 1900, nor J. Sm., 1809].

Additional bibliography: Moldenke, Alph. List Cit. 2: 389 (1948), 3: 671 & 732 (1949), and 4: 1302. 1949; Moldenke, Phytologia 19: 16. 1969.

ERIOCAULON ARENICOLA Britton & Small

Additional bibliography: Moldenke, Alph. List Cit. 1: 64 (1946), 2: 650 (1948), and 4: 1094. 1949; Moldenke, Phytologia 19: 16 & 100. 1969.

ERIOCAULON ARISTATUM H. Hess

Additional bibliography: Moldenke, Phytologia 19: 17. 1969.

Additional citations: ANGOLA: Huila: Welwitsch 2444 (B).

ERIOCAULON ATABAPENSE Moldenke

Additional bibliography: Moldenke, Alph. List Cit. 4: 1078 & 1132. 1949; Moldenke, Phytologia 17: 481. 1969.

The Schultes, Baker, & Cabrera 18274, distributed as E. atabapense in some herbaria, is the type collection of E. vaupesense Moldenke.

ERIOCAULON ATRATUM Körn.

Additional & emended bibliography: Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 1, 341. 1864; Ruhl. in Engl., Bot. Jahrb. 27: 66. 1899; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 2, 341. 1964; Moldenke, Phytologia 19: 17--18. 1969.

The E. atratum accredited to Nakai is actually a synonym of E. atrum Nakai, while the homonym attributed to Thwaites belongs in the synonymy of E. subglaucum Ruhl.

ERIOCAULON ATRATUM var. **MAJOR** Thwaites

Emended synonymy: Eriocaulon caulescens Hook. f. & Thoms. ex Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 1, 341, in syn. 1864 [not E. caulescens Poir., 1813, nor Willd., 1863].

Additional & emended bibliography: Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 1, 341 (1864) and pr. 2, 341. 1964; Moldenke, Phytologia 19: 17--18. 1969.

ERIOCAULON ATRUM Nakai

Emended synonymy: Eriocaulon atratum Nakai ex Moldenke, Phytologia 17: 390, in syn. 1969 [not E. atratum Körn., 1856, nor

Thwaites, 1864].

Additional bibliography: Moldenke, Alph. List Cit. 4: 1168. 1949; Moldenke, Phytologia 19: 18. 1969.

The E. atratum Körn., referred to in the synonymy above, is actually a valid species, but the homonym accredited to Thwaites is a synonym of E. subglaucum Ruhl.

ERIOCAULON AUSTRALE R. Br.

Additional & amended bibliography: R. Br., Prodr. Fl. Nov. Holl., pr. 1, 1: 254 (1810) and pr. 2, [Isis 1819:] 47. 1819; Körn., Linnaea 27: 686. 1856; Maxim., Diagn. Pl. Nov. Asiat. 8: 7 & 27. 1893; Fyson, Journ. Indian Bot. 2: 320. 1921; Moldenke, Alph. List Cit. 2: 456, 457, & 461 (1948), 3: 892 (1949), and 4: 1205. 1949; Tingle, Check List Hong Kong Pl. 54. 1967; Moldenke, Phytologia 19: 66--67. 1969.

This taxon, if one may judge from specimens so identified in herbaria, is very similar in appearance to E. sexangulare L. and E. willdenovianum Moldenke. According to Ruhland (1903), however, E. australe is trimerous. If this is true, then it could be conspecific with E. sexangulare, but not with the dimerous E. willdenovianum. Ruhland says that in E. australe "Flores normaliter, staminibus raro abortu oligomeris exceptis, evoluti. Perigonia semper homio [3-]mera", while in E. sexangulare "Flores partim modo trimeri, saepe \pm reducti".

Fyson (1921) says for E. australe "closely allied to E. sexangulare L., being similar in the head and the female sepals" and cites a specimen from China in the Calcutta herbarium.

Maximowicz (1893) cites Hance s.n. from Hongkong and Sampson s.n. from Canton. He avers that it differs from what he calls E. wallichianum Mart. [now regarded as E. sexangulare L.] in the following respects: "Ab E. Wallichiano differt foliis angustioribus pilosis, capitulo primum hemisphaerico, tum e basi truncata globosis nonnihil minoribus et pallidioribus, floribus minoribus (2,25 mm. nec 3 mm. longis), bracteis floralibus late obovatis acutiusculis apice incurvis (neque cuneatis), perigonii σ interioris laciniis linearibus apice fimbriatis glandula infraapicali distinctissima oblonga nigra (nec deltoideis glabris glandula minuta punctiformi), perigonii ϕ externi phyllis apice breve pubescentibus (neque glabris), interioris in utraque specie (contra Koernickeum) exterius subaequantis, phyllis spongiosis apice dense fimbriatis cum glandula infraapicali lineari distinctissima (nec obsoleta phyllis albis pellucidis), ovario distincte (nec vix) stipitato."

The Brass 5751 & 5752 cited by Van Royen (1959) are E. willdenovianum Moldenke. Tingle (1967) records E. australe from Hongkong and reports the common name "hairy pipewort" for it there, a name applied in the United States to Lachnocaulon anceps (Walt.) Morong. It is more probable, however, that his record applies rather to the common E. sexangulare L.

ERIOCAULON BAURI N. E. Br.

Emended synonymy: Eriocaulon baurii N. E. Br. apud Ruhl. in Engl., Bot. Jahrb. 27: 70, 77, & 78. 1899.

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 70, 77, & 78. 1899; Moldenke, Phytologia 18: 79. 1969.

ERIOCAULON BEAUVERDI Moldenke

Additional bibliography: Moldenke, Alph. List Cit. 2: 365 & 533 (1948), 3: 669 & 815 (1949), and 4: 1301. 1949; Moldenke, Phytologia 19: 19. 1969.

ERIOCAULON BENTHAMII Kunth

Additional bibliography: Moldenke, Alph. List Cit. 1: 261 (1946), 2: 539, 540, & 639 (1948), and 3: 768 & 831. 1949; Moldenke, Phytologia 19: 19 & 43. 1969.

ERIOCAULON BIFISTULOSUM Van Heurck & Muell.-Arg.

Additional & emended bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 69, 74, & 75. 1899; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 49. 1930; Moldenke, Alph. List Cit. 3: 747 (1949) and 4: 1158. 1949; Moldenke, Phytologia 19: 14, 19-20, 78, 97, & 98 (1969) and 19: 234, 236, 237, & 244. 1970.

ERIOCAULON BILOBATUM Morong

Additional bibliography: Moldenke, Alph. List Cit. 2: 351, 370, 459, & 461 (1948), 3: 829, 830, & 973 (1949), and 4: 1238. 1949; Moldenke, Phytologia 19: 20 & 95. 1969.

ERIOCAULON BOMBAYANUM Ruhl.

Additional bibliography: Fyson, Journ. Indian Bot. 2: 320. 1921; Moldenke, Phytologia 18: 169. 1969.

ERIOCAULON BONGENSE Engl. & Ruhl.

Additional & emended bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 69 & 75. 1899; Moldenke, Phytologia 19: 20. 1969.

Emended citations: SÉNÉGAL: Winkoun 2 (Rf).

ERIOCAULON BRACHYPEPLON Körn.

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 66. 1899; Moldenke, Phytologia 19: 67. 1969.

ERIOCAULON BREVIPELUNCULATUM Merr.

Additional synonymy: Eriocaulon brevipedunculata Merr., in herb.

Additional bibliography: Moldenke, Phytologia 19: 65, 67, & 71. 1969.

ERIOCAULON BROWNIANUM Mart.

Additional & emended bibliography: Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 1, 341. 1864; Moldenke, Alph. List Cit. 2: 461 (1948) and 4: 1102 & 1220. 1949; Thwaites & Hook. f., Enum. Pl.

Zeyl., pr. 2, 341. 1964; Sebastine & Vivekanathan, Bull. Bot. Surv. India 9: 165 & 183. 1967; Moldenke, Phytologia 19: 21—22. 1969.

ERIOCAULON BRUNONIS Britten

Additional & emended bibliography: R. Br., Prodr. Fl. Nov. Holl., pr. 1, 1: 255 (1810) and pr. 2, [Isis 1819:] 48. 1819; Kunth, Enum. Pl. 3: 568. 1841; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 49. 1930; Moldenke, Alph. List Cit. 2: 456, 457, & 459 (1948), 3: 932 & 969 (1949), and 4: 988, 1119, 1175, & 1205. 1949; Van Royen, Nov. Guin., new ser., 10: 38 & 43. 1959; Moldenke, Phytologia 19: 22 & 92. 1969.

The Chapelier s.n., distributed as E. scariosum R. Br., is actually E. willdenovianum Moldenke.

ERIOCAULON BUCHANANII Ruhl.

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 68, 72, & 83. 1899; Moldenke, Alph. List Cit. 2: 424 & 461 (1948) and 3: 977. 1949; Moldenke, Phytologia 19: 22 (1969) and 19: 246. 1970.

ERIOCAULON BUERGERIANUM Körn.

Additional bibliography: Körn. in Miq., Prodr. Fl. Iap. 327—328. 1867; Miq., Cat. Mus. Lugd. Bat. 108. 1870; Maxim., Diagn. Pl. Nov. Asiat. 8: 7 & 20—21. 1893; Moldenke, Alph. List Cit. 2: 634 (1948), 3: 659 & 702 (1949), and 4: 1011, 1178, & 1288. 1949; Moldenke, Phytologia 19: 22—23. 1969.

In a previous installment of these notes I stated that Kawakami 431 is not E. buergerianum. However, the University of California specimen of this number definitely is this species. It was originally distributed as E. pachypetalum Hayata, then changed to E. pterospermum Hayata; it is also not E. sexangulare L., as has been suggested.

Maximowicz (1893) cites Henry 37 & 2767 from Hupeh, Shearer s. n. from Kenkiang, Makino s. n. from Shikoku, Savatier 1361 from Jokoska, Siebold s. n. from Kiushu, and Tashiro s. n. from Oshima. He records the Japanese vernacular name, "ō hoshikusa". He comments that "Spec. chinense Shearerii ceterum congruum in capitulo uno quod dissecavi capsulas omnes 1-loculares stigmatibus 1 et perigonia exteriora glabriuscula habet, ideo subdubium videtur".

Additional citations: FORMOSA: Kawakami 431 (Ca--344947).

ERIOCAULON CANDIDUM Moldenke

Additional bibliography: Moldenke, Phytologia 17: 486—487. 1969.

This species has been collected in flower and fruit in November.

Additional citations: BRAZIL: Rio Grande do Sul: J. Vidal IV. 174 (Ca--1114714), IV.336 (Ca--1169423).

ERIOCAULON CARSONI F. Muell.

Additional bibliography: Van Royen, Nov. Guin., new ser., 10: 41. 1959; Moldenke, Phytologia 19: 23, 81, & 98. 1969.

ERIOCAULON CEYLANICUM Körn.

Additional bibliography: Moldenke, Alph. List Cit. 2: 626. 1948; Moldenke, Phytologia 19: 24. 1969.

ERIOCAULON CINEREUM R. Br.

Additional synonymy: Eriocaulon sieboldianum Siebert & Zuccarini apud Van Royen, Nov. Guin., new ser., 10: 25, in syn. 1959. Eriocaulon cinerum R. Br. apud Joseph & Vajravelu, Bull. Bot. Surv. India 9: 29, sphalm. 1967.

Additional & amended bibliography: R. Br., Prodr. Fl. Nov. Holl., pr. 1, 1: 254 (1810) and pr. 2, [Isis 1819:] 48. 1819; Körn. in Miq., Prol. Fl. Iap. 326. 1867; Miq., Cat. Mus. Lugd. Bat. 109. 1870; Maxim., Diagn. Pl. Nov. Asiat. 8: 6, 10, 12—13, & 18. 1893; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 49. 1930; Moldenke, Alph. List Cit. 2: 460, 461, 490, 492, 529, 618, 625, & 634 (1948), 3: 707, 715, 727, 879, 892, 972, 973, & 977 (1949), and 4: 985, 1011, 1102, 1128, 1145, 1148, 1178, 1189, 1201, 1206, 1210, 1221, 1261, & 1288. 1949; Datta & Majumdar, Bull. Bot. Soc. Bengal 20: 39. 1966; Tingle, Check List Hong Kong Pl. 54. 1967; Joseph & Vajravelu, Bull. Bot. Surv. India 9: 29. 1967; S. K. Jain, Bull. Bot. Surv. India 9: 76. 1967; Panigr. & Saran, Bull. Bot. Surv. India 9: 260. 1967; Vajravelu, Joseph, & Chandr., Bull. Bot. Surv. India 10: 81. 1968; M. A. Rau, Bull. Bot. Surv. India 10, Suppl. 2: 84. 1969; Moldenke, Phytologia 19: 67, 70, & 78 (1969) and 19: 234, 236, 238, 243, 244, & 246. 1970.

Tingle (1967) regards E. cinereum R. Br. and E. sieboldianum Sieb. & Zucc. as distinct species and records the common names "gray pipewort" and "Siebold's pipewort" for them, respectively, in Hongkong. Vajravelu & his associates (1968) cite J. Joseph 17786 from Kerala, India, as representing E. cinereum.

Van Royen (1959) not only spells the first of the synonyms listed above in a different manner from the way it was spelled by Steudel in the reference given by Van Royen, but he also cites an incorrect page number ("273" instead of 272) and an incorrect first author ("Siebert" instead of Philipp Franz Jonkheer von Siebold, 1795—1866). Steudel's original entry reads "sieboldtiamm Sieb. Zucc."

It should be noted here that the Angolan E. stuhlmanni N. E. Br., reduced by Ruhland to synonymy under this species, seems not to belong here. Examination of type material leads me to believe that it is a distinct taxon, which see in these notes. The variant spelling, E. stühlmannii N. E. Br., should, of course, also be removed from the synonymy of E. cinereum.

Jain (1967) records the species from Rajasthan and claims that it has "north African affinity"; Joseph & Vajravelu (1967) cite no. 14453 from Madhya Pradesh, India, while Panigr. & Saran (1967) record it from Uttar Pradesh.

Maximowicz (1893), under E. heteranthum Benth., cites Sampson & Hance s.n. from Canton, and notes "A Bentham (Fl. Austral. VII, 193) ad E. cinereum R. Br. ductum, sed Schultzei n. 368 huc ductus habitu diversus est et capitula minuta habet, alia vero spec. australiensia non vidi, quam ob causam hic distinctum servavi".

The Loher 6987, cited below, is a mixture with E. zollingerianum Körn. The Chiao s.n. [Herb. Univ. Nanking 22344], Karta 317, and Toroos 4572 & 5024, distributed as E. cinereum, are actually E. truncatum Hamilt.

Additional & emended citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Luzon: Loher 1605 (W--389002). Island undetermined: Loher 6987, in part (W--713809).

ERIOCAULON COLLINUM Hook. f.

Additional bibliography: Sebastine & Vivekanathan, Bull. Bot. Surv. India 9: 165 & 183. 1967; Kammathy, Rao, & Rao, Bull. Bot. Surv. India 9: 232. 1967; Moldenke, Phytologia 19: 11, 24, & 27. 1969.

Sebastine & Vivekanathan (1967) report this species as "common" at 2067 meters altitude in Kerala, India, flowering in April, and cite Subramanyam 10241, while Kammathy & his associates (1967) cite Barnes s.n. from Mysore, flowering in June.

ERIOCAULON COMPRESSUM Lam.

Additional synonymy: Eriocaylon compressum Lam. ex Moldenke, Alph. List Cit. 1: 29 & 293, sphalm. 1946.

Additional & emended bibliography: Sauv., Anal. Acad. Ci. Habana 8: 48. 1871; Sauv., Fl. Cub. 163. 1871; N. L. Britton, Man., pr. 1, 237 (1901), pr. 2, 237 (1902), pr. 3, 237 (1905), and pr. 4, 237. 1907; Britton & Br., Illustr. Fl., ed. 2, pr. 1, 1: 454, fig. 1142. 1913; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 44. 1930; Britton & Br., Illustr. Fl., ed. 2, pr. 2, 1: 454, fig. 1142 (1936), pr. 3, 1: 454, fig. 1142. 1943; Moldenke, Alph. List Cit. 1: 7, 15--17, 23, 24, 29, 33, 34, 41, 42, 45, 74, 89, 90, 98, 103, 113, 115, 116, 120, 124, 129, 138--140, 151, 153, 164, 174, 175, 195, 205, 211, 226, 234, 239, 240, 245, 248, 249, 253, 257, 276, 279, 280, 282, 284, 285, & 290--296. 1946; Britton & Br., Illustr. Fl., ed. 2, pr. 4, 1: 454, fig. 1142. 1947; Moldenke, Alph. List Cit. 2: 361, 405, 406, 409, 412, 454, 459, 461, 473, 476, 478--480, 492, 493, 496, 507, 511, 512, 514, 524, 526, 530, 536, 545, 554, 559, 568, 572, 588, 610, 632, 639, & 643 (1948), 3: 660, 697, 698, 721, 742--744, 750, 755, 774, 776, 777, 789, 790, 794, 841, 850--852, 857, 884, 892, 898, 899, 931, 936, 939, 941--946, 958, 964, & 972 (1949), and 4: 985, 991, 1001--1003, 1015, 1077, 1081, 1099, 1102, 1111, 1112, 1118, 1135, 1138, 1145, 1173, 1176, 1177, 1179--1181, 1188, 1192, 1201, 1202, 1211, 1214, 1216, 1222, 1225, 1227, 1238, 1244, 1288, & 1293. 1949; J. D. Montgomery, N. J. Nat. News 18: 122. 1963; Moldenke, Biol. Abstr. 50: 4149 & 6336. 1969; Moldenke, Phytologia 19: 27--28, 32, 105, & 109 (1969) and 19: 232. 1970.

Additional & emended illustrations: Britton & Br., Illustr. Fl., ed. 2, pr. 1, 1: 454, fig. 1142 (1913), pr. 2, 1: 454, fig. 1142 (1936), pr. 3, 1: 454, fig. 1142 (1943), and pr. 4, 1: 454, fig. 1142. 1947.

The Sauvalle, Fl. Cub. reference cited above is sometimes dated "1868" by authors, but, according to the late Dr. J. H. Barnhart, the portion of the work concerned here was not issued until 1971. The plant referred to in both Sauvalle references is actually E. pseudocompressum Ruhl.

Tomlinson found E. compressum "in scrub cypress" and "in sandy pineland, plants mostly solitary in damper places, some seen submerged in swampy parts", while Gillis found it "in bog with standing water, flowers white, dominant".

The G. L. Fisher s.n. [Nome, Apr. 27, 1938], distributed as E. compressum, is actually E. texense Körn.

Additional citations: FLORIDA: Collier Co.: Tomlinson 31-3-63 C (Ft--279). Monroe Co.: Tomlinson 29-1-63 A (Ft--280, Ft--280, Ft--280). Polk Co.: Gillis 6464 (Ft--2707). County undetermined: J. K. Small s.n. [Daphne, April 22, 1921] (N). TEXAS: Houston Co.: E. J. Palmer 13185 (B).

ERIOCAULON COMPRESSUM var. HARPERI Moldenke

Additional bibliography: Moldenke, Alph. List Cit. 1: 17, 23, 24, 29, 41, 226, 257, 290, & 291 (1946), 2: 632 (1948), 3: 742, 939, 943, & 944 (1949), and 4: 1003, 1201, & 1227. 1949; Moldenke, Phytologia 18: 80 & 83. 1969; Moldenke, Biol. Abstr. 50: 6336. 1969.

ERIOCAULON CRASSISCAPUM Bong.

Additional & emended bibliography: Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 43 & 48, fig. 16 E & F & 17. 1930; Moldenke, Alph. List Cit. 4: 1209. 1949; Moldenke, Phytologia 19: 29. 1969.

Emended illustrations: Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 43 & 48, fig. 16 E & F & 17. 1930.

ERIOCAULON CRISTATUM Mart.

Additional & emended bibliography: Benth., Fl. Hongk. 382. 1861; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 1, 341. 1864; Maxim., Diagn. Pl. Nov. Asiat. 8: 6, 14, & 22. 1893; Moldenke, Alph. List Cit. 4: 1288. 1949; Tingle, Check List Hong Kong Pl. 54. 1957; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 2, 341. 1964; Moldenke, Phytologia 19: 23, 29--30, & 75. 1969.

Tingle (1967) records this species from Hongkong and calls it the "crested pipewort", but it is most probably var. brevicalyx C. H. Wright to which he is here referring.

Thwaites & Hooker (1864) describe but do not name a variety as follows: "var. bracteis floralibus denticulatis et longiuscule cuspidato-acuminatis. C.P. 789. Hab. Rambodde, in the Central Province, Gardner. This may possibly be a distinct species. The

flowers are monoecious, and the flower bracts are different in shape from those of the ordinary form of E. cristatum; but the two plants are so conformable in other respects that I cannot venture to separate them."

ERIOCAULON CUBENSE Ruhl.

Additional bibliography: Moldenke, Alph. List Cit. 1: 186. 1946; Moldenke, Phytologia 17: 497. 1969.

ERIOCAULON CUSPIDATUM Dalz.

Additional & emended bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 68. 1899; Fyson, Journ. Indian Bot. Soc. 2: 317—318 & 320, pl. 38. 1921; Arora, Bull. Bot. Surv. India 10: 65. 1968; Moldenke, Phytologia 19: 30. 1969.

Arora (1968) reports this plant as common in sandy wet soil of running streams in India and cites Arora 686h.

ERIOCAULON DALZELII Körn.

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 66, 69, & 75. 1899; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 49. 1930; Moldenke, Alph. List Cit. 3: 813 (1949) and 4: 1099 & 1128. 1949; Moldenke, Phytologia 19: 30. 1969.

ERIOCAULON DECANGULARE L.

Additional synonymy: Eriocaulon villosum Willd. ex Körn., Linnaea 27: 596, in syn. 1856 [not E. villosum Ell., 1968, nor Michx., 1803, nor Salzm., 1855].

Additional & emended bibliography: Steud., Syn. Fl. Glum. 2: [Cyp.] 277. 1855; Körn., Linnaea 27: 596. 1856; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 878 & 879 (1893) and 2: 681 & 1021. 1895; Ruhl. in Engl., Bot. Jahrb. 27: 73. 1899; N. L. Britton, Man., pr. 1, 237 (1901), pr. 2, 237 (1902), pr. 3, 237 (1905), and pr. 4, 237. 1907; Britton & Br., Illustr. Fl., ed. 2, pr. 1, 1: 455, fig. 1143. 1913; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 39 & 49. 1930; Britton & Br., Illustr. Fl., ed. 2, pr. 2, 1: 455, fig. 1143 (1936) and pr. 3, 1: 455, fig. 1143. 1943; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 878 & 879 (1946) and 2: 681 & 1021. 1946; Moldenke, Alph. List Cit. 1: 7, 13, 15, 24, 25, 33, 35, 37, 38, 42, 43, 45, 49, 55, 59—61, 79, 80, 99, 103, 112, 115—117, 120, 124, 125, 128, 137—140, 152, 153, 160, 165, 166, 175—177, 199, 200, 205, 239, 240, 242, 245, 248—250, 253, 257, 258, 269, 278—280, 283, 285, 287, & 291—296. 1946; Britton & Br., Illustr. Fl., ed. 2, pr. 4, 1: 455, fig. 1143. 1947; Moldenke, Alph. List Cit. 2: 358, 361, 455, 456, 460, 461, 473, 475, 476, 480, 491—493, 496, 507, 524, 529, 530, 536, 543, 545, 548, 554, 555, 576, 588, 604, 609, 614, 617, 632, 639, & 641 (1948), 3: 656, 660, 668, 671, 699, 709, 720—722, 738, 741, 742, 745, 749, 750, 753, 759, 760, 774, 776—778, 783, 789, 794, 800, 805—807, 813, 824, 835, 841, 850, 851, 856, 869, 880, 884, 898, 899, 911, 916, 926, 927, 931, 936, 937, 939, 942, 943, 948, 964, 972, & 977 (1949), and 4: 986, 990, 991, 993, 998,

1002--1004, 1014, 1085, 1086, 1095, 1105, 1107, 1114, 1115, 1117--1119, 1132, 1135, 1137, 1138, 1170, 1176--1179, 1198, 1200--1202, 1210, 1212, 1220, 1222, 1225--1227, 1231, 1235, 1239, 1243, 1252, 1255, & 1291. 1949; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 878 & 879 (1960) and 2: 681 & 1021. 1960; Moldenke, Biol. Abstr. 50: 4449 & 6336. 1969; Moldenke, Phytologia 19: 27, 28, 31--33, 70, 75, 105, & 109 (1969) and 19: 230, 232, 238, & 244. 1970.

Additional & emended illustrations: Britton & Br., Illustr. Fl., ed. 2, pr. 1, 1: 455, fig. 1143 (1913), pr. 2, 1: 455, fig. 1143 (1936), pr. 3, 1: 455, fig. 1143 (1943), and pr. 4, 1: 455, fig. 1143. 1947.

According to Körnicke (1856) Willdenow's E. villosum is based on Herb. Willdenow "2364, fol. 3 (v.s.), nec Mich." It should be noted here that the E. villosum accredited to Elliot and to Michaux are both synonyms of Lachnocaulon anceps (Walt.) Morong, while the homonym credited to Salzmann belongs in the synonymy of Paepalanthus bifidus (Schrad.) Kunth.

Rafinesque's original description (1840) of his E. longifolium is "fol. gramineis longissimis pedalis latiusculis obtusis, scapis fol. saepe breviorib. usque ad medium vaginatis, apice contortis costatis, capit. depressis, bract. ovatis acutis scariosis fulvis pubens -- South New Jersey in swamps, leaves pedal, scapes slender rigid, heads small, fl. pale."

Fernald & Long report E. decangulare from sandy and peaty shores in Virginia.

The following specimens have been regarded as typical E. decangulare L. by Kral and were so cited by me previously, but are now regarded by me as representing E. decangulare var. minor, which see: F. A. Barkley 13543 (type) & 13556, Herb. Zuccarini s.n. [Texas], Kral 17208, Rowell 8050 & 8071, and Tharp 4434c, 4434d, & 44344b. The following collections were also regarded as typical E. decangulare by me previously, but are now cited by me under E. decangulare f. parviceps, which see: F. A. Barkley 13034, Correll & Correll 12516, E. Hall 675 [cited as "635" in Phytologia 1: 315], Painter & Barkley 13540, Rowell 8136, Tharp 44342 (type), and Webster & Wilbur 3199. The H. Gentry 2481, distributed as E. decangulare, is herein cited as E. texense Körn. Tomlinson 10-6-63 E is E. decangulare var. latifolium Chapm.

Additional citations: VIRGINIA: Sussex Co.: Fernald & Long 14923 (N). FLORIDA: Flagler Co.: R. W. Read 1047 (Ft--278, Ft--278).

ERIOCAULON DECANGULARE var. LATIFOLIUM Chapm.

Additional bibliography: Moldenke, Alph. List Cit. 1: 285 (1946) and 3: 806. 1949; Moldenke, Phytologia 19: 33. 1969.

Tomlinson found this variety growing in wet ditches, flowering

and fruiting in June, and comments that it is "the largest of Florida's eriocauloids". He identified it as typical E. decangulare L.

Additional citations: FLORIDA: Highlands Co.: Tomlinson 10-6-63 (Ft--281, Ft--281, Ft--281, Ft--281).

ERIOCAULON DECANGULARE var. MINOR Moldenke

Additional bibliography: Moldenke, Phytologia 19: 32 & 33. 1969.

Recent collectors have found this variety growing "in moist places of bog proper", flowering in April and fruiting in June.

Additional citations: TEXAS: Leon Co.: F. A. Barkley 13556 (Au, Ca--841811, N). Milam Co.: Tharp 4434c (Au, Au, N), 44344 (N), 44344b (N, Ok). Robertson Co.: Rowell 8050 (N).

ERIOCAULON DECANGULARE f. PARVICEPS Moldenke, f. nov.

Haec forma a forma typica speciei capitulis maturis usque ad 8 mm. latis 6 mm. altis recedit.

This form of the species differs from the typical form in having its mature fruiting heads only to about 8 mm. wide and 6 mm. high. The entire plant is also usually smaller and the leaves are shorter, narrower, and less firm in texture than in the typical form.

The type of the form was collected by Benjamin Carroll Tharp (no. 44342) in Newton County, Texas, on July 23, 1939, and is deposited in the Britton Herbarium at the New York Botanical Garden.

Webster & Wilbur describe the flower-heads as "whitish" and the plant as "common in low moist areas in woods of longleaf pine and some hardwoods with open grassy areas", Rowell found it "in very moist peaty sand of bogs", Painter & Barkley, as well as Hall, found it in bogs, while Barkley alone says that it grows "in bogs, in streams, and in water pools in bogs". It has been collected in flower and fruit from June to August. Material has been identified and distributed in herbaria as E. decangulare L. and E. texense Körn. E. Hall 675 has been cited by me in a previous publication as "635" because the handwritten number on the Britton Herbarium specimen is very difficult to read.

Citations: TEXAS: Hempstead Co.: E. Hall 675 (N, Pa, Po--119240, Pr, Ur). Jasper Co.: Correll & Correll 12516 (N, Rf). Newton Co.: Tharp 44342 (Au--isotype, N--type). Robertson Co.: F. A. Barkley 13034 (Al, N, N); Painter & Barkley 13540 (Gg--321530, N, N); Rowell 8136 (N). Tyler Co.: Webster & Wilbur 3199 (N, W--2067946).

ERIOCAULON DECENFLORUM Maxim.

Additional & emended bibliography: Maxim., Diagn. Pl. Nov. Asiatic. 8: 5 & 7--9. 1893; Moldenke, Alph. List Cit. 2: 618. 1948; Moldenke, Phytologia 19: 33--34. 1969.

Maximowicz (1893) cites the type of this species as follows: "Nippon media (Tschonoski, 1866 fl. frf.)," and comments "Cum se-

quente [E. nipponicum Maxim.] inter Dimera seriam propriam capitulis radiantibus constituit, ceterum habitu proprio gaudens, e longinquo tantum E. stellulato Kvern. subsimile."

ERIOCAULON DEIGHTONII Meikle

Additional bibliography: Moldenke, *Phytologia* 19: 34. 1969; Anon., *Assoc. Etud. Tax. Fl. Afr. Trop. Index* 1968: 24. 1969.

ERIOCAULON DEPRESSUM R. Br.

Additional & emended bibliography: R. Br., *Prodr. Fl. Nov. Holl.*, pr. 1, 1: 255 (1810) and pr. 2, [*Isis* 1819:] 48. 1819; Moldenke, *Phytologia* 19: 67 & 68. 1969.

ERIOCAULON DESLANDESII Alv. Silv.

Additional bibliography: Moldenke, *Phytologia* 19: 34. 1969. This species has been collected in flower and fruit in December.

Additional citations: BRAZIL: Rio Grande do Sul: J. Vidal IV. 409 (Ca--1169393).

ERIOCAULON DIANAE Fyson

Additional synonymy: Eriocaulon dianea Fyson apud Joseph & Vajravelu, *Bull. Bot. Surv. India* 9: 29, sphalm. 1967.

Additional bibliography: Joseph & Vajravelu, *Bull. Bot. Surv. India* 9: 29. 1967; Inamdar, *Bull. Bot. Surv. India* 10: 131. 1968; Moldenke, *Phytologia* 19: 35 (1969) and 19: 246. 1970.

Inamdar (1968) records this species from Gujarat, India.

ERIOCAULON DIANAE var. RICHARDIANUM Fyson

Additional synonymy: Eriocaulon dianea var. richardiana Fyson apud Joseph & Vajravelu, *Bull. Bot. Surv. India* 9: 29, sphalm. 1967.

Additional bibliography: Joseph & Vajravelu, *Bull. Bot. Surv. India* 9: 29. 1967; Moldenke, *Phytologia* 19: 36. 1969.

Joseph & Vajravelu (1967) cite their no. 13482 from Madhya Pradesh, India.

ERIOCAULON DICLINE Maxim.

Synonymy: Eriocaulon species incerta Miq., *Cat. Mus. Lugd. Bat.* 109. 1870. Eriocaulon sp. incerta Miq. apud Maxim., *Diagn. Fl. Nov. Asiat.* 8: 21, in syn. 1893.

Additional & emended bibliography: Miq., *Cat. Mus. Lugd. Bat.* 109. 1870; Maxim., *Diagn. Fl. Nov. Asiat.* 8: 7 & 21--22. 1893; Moldenke, *Phytologia* 19: 36. 1969.

Maximowicz (1893) cites the type of this species as "E. sp. incerta Miq. *Cat. L. Bat.* 109. K. 1. Japonia (Herb. Lugd. Bat.!)". He comments that "Structura perigonii interni fere E. cristati Mart., sed externum in hoc triphyllum".

ERIOCAULON DICTYOPHYLLUM Körn.

Additional bibliography: Moldenke, Alph. List Cit. 3: 849. 1949; Moldenke, Phytologia 19: 36. 1969.

ERIOCAULON DREGEI Hochst.

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 71 & 81. 1899; Moldenke, Phytologia 19: 37. 1969.

ERIOCAULON EBERHARDTII H. Lecomte

Additional & emended bibliography: H. Lecomte, Not. Syst. 2: 215 & 216 (1912) and 2: 393. 1913; Moldenke, Phytologia 19: 37. 1969.

ERIOCAULON ECHINOSPERMUM C. Wright

Additional & emended bibliography: Sauv., Fl. Cub. 162. 1871; Moldenke, Alph. List Cit. 1: 63 & 187 (1946), 3: 930 (1949), and 4: 1144 & 1145. 1949; Moldenke, Phytologia 18: 58. 1968.

The Sauvalle reference cited above is sometimes cited as "1868" (e.g., Phytologia 18: 58. 1968), but, according to the late Dr. J. H. Barnhart, the portion of the work concerned here was not actually published until 1871.

ERIOCAULON ECHINULATUM Mart.

Additional bibliography: Körn., Linnaea 27: 619. 1856; Hance, Journ. Bot. 16: 14. 1878; Maxim., Diagn. Pl. Nov. Asiat. 8: 6 & 11—12. 1893; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 49. 1930; Moldenke, Alph. List Cit. 2: 461 (1948) and 3: 892. 1949; Moldenke, Phytologia 19: 37 (1969) and 19: 237. 1970.

Maximowicz (1893) cites Hance s.n. and Sampson s.n. from Canton, China. The type of the species is from Tavoy, Tenasserim, Burma. Hance also cites the Sampson collection (1878) and says "This pretty little species had hitherto only been recorded from Burma".

ERIOCAULON EHRENBORGIANUM Klotzsch

Additional bibliography: Moldenke, Alph. List Cit. 1: 36, 89, 115, 182, & 314 (1946), 2: 370, 459, 461, 476, 494, 526, 549, & 639 (1948), 3: 784, 829, 830, 848, 871, 898, 925, & 961 (1949), and 4: 1003, 1077, 1167, 1171, 1225, & 1241. 1949; Moldenke, Phytologia 19: 37—38, 94, & 95. 1969.

ERIOCAULON EKMANII Ruhl.

Additional bibliography: Moldenke, Alph. List Cit. 1: 187 (1946) and 4: 1304. 1949; Moldenke, Phytologia 18: 86. 1969.

ERIOCAULON ELEGANTULUM Engl.

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 72 & 83. 1899; Moldenke, Phytologia 18: 62. 1968.

ERIOCAULON ELENORAE Fyson

Additional synonymy: Eriocaulon eleonare Fyson ex Inamdar, Bull. Bot. Surv. India 10: 131, sphalm. 1968.

Additional bibliography: Inamdar, Bull. Bot. Surv. India 10: 131. 1968; Moldenke, Phytologia 19: 38. 1969; Moldenke, Biol. Abstr. 50: 4449. 1969.

ERIOCAULON ELICHRYSOIDES Bong.

Additional bibliography: Moldenke, Alph. List Cit. 3: 815. 1949; Moldenke, Phytologia 19: 19 & 38. 1969.

Material of this species has been misidentified and distributed in herbaria under the name E. helichrysoides Kunth. It has been collected in anthesis and fruit in August.

ERIOCAULON EURYPEPLON Körn.

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 68. 1899; Moldenke, Phytologia 19: 39. 1969.

ERIOCAULON FENESTRATUM Bojer

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 71 & 81. 1899; Moldenke, Phytologia 19: 39. 1969.

ERIOCAULON FISTULOSUM R. Br.

Additional & emended bibliography: R. Br., Prodr. Fl. Nov. Holl., pr. 1, 1: 255 (1810) and pr. 2, [Isis 1819:] 48. 1819; Moldenke, Phytologia 19: 40. 1969.

ERIOCAULON FRIESIORUM Bullock

Additional bibliography: Hedberg, Symb. Bot. Upsal. 15 (1): 263. 1957; Moldenke, Phytologia 19: 40 & 96. 1969.

ERIOCAULON FULIGINOSUM C. Wright

Additional & emended synonymy: Eriocaulon spaerospermum C. Wright ex Sauv., Anal. Acad. Ci. Habana 7: 716—717. 1871. Euriocaulon fuliginosum C. Wright ex Sauv., Fl. Cub. 163, sphalm. 1871. Eriocaulon sperospermum C. Wright apud Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 879. 1893. Eriocaulon sphaerospermum C. Wright ex Moldenke, N. Am. Fl. 19 (1): 19 & 28, in syn. 1937.

Additional & emended bibliography: Sauv., Anal. Acad. Ci. Habana 7: 715—717 (1871) and 8: 48. 1871; Sauv., Fl. Cub. 161—163. 1871; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 878 & 879 (1893) and pr. 2, 1: 878 & 879. 1946; Moldenke, Alph. List Cit. 1: 3, 63, 120, 186, 187, & 231 (1946), 2: 333, 334, 412, 460, 650, & 651 (1948), 3: 805 & 929 (1949), and 4: 1143, 1210, & 1304. 1949; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 878 & 879. 1960; Moldenke, Phytologia 19: 40. 1969.

Sauvaille's Fl. Cub. reference cited above is sometimes dated "1868", but, according to the late Dr. J. H. Barnhart, this is incorrect for the page in question

ERIOCAULON GIBBOSUM Körn.

Additional bibliography: Moldenke, Alph. List Cit. 1: 223 (1946) 3: 676 & 855 (1949), and 4: 1086, 1113, 1296, & 1297. 1949; Molden-

ke, *Phytologia* 19: 40—41. 1969.

Additional citations: BRAZIL: Goiás: Irwin, Maxwell, & Wasshausen 21632 (N). Mattogrosso: Nienstedt 202 (Ac).

ERIOCAULON GILGIANUM Ruhl.

Additional & emended bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 72 & 84. 1899 [Apr. 7]; Moldenke, *Phytologia* 19: 12 & 41—42. 1969.

ERIOCAULON GLABRIFLORUM Ridl.

This taxon is conspecific with E. truncatum Hamilt. and Ridley's binomial must be reduced to synonymy under E. truncatum, which see.

ERIOCAULON GRACILE Mart.

Martius' name for this taxon is invalid and must be replaced by E. infirmum Steud., which see.

ERIOCAULON GRACILE var. KURZII Fyson

This taxon is now more correctly known as E. infirmum var. kurzii (Fyson) Moldenke, which see.

ERIOCAULON GRACILE var. PUBERULENTUM Moldenke

This taxon is now more correctly known as E. infirmum var. puberulentum (Moldenke) Van Royen, which see.

ERIOCAULON GREGATUM Körn.

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 66. 1899; Moldenke, *Phytologia* 19: 42. 1969.

ERIOCAULON GUADALAJARENSE Ruhl.

Additional bibliography: Moldenke, Alph. List Cit. 2: 461 (1948) and 3: 829. 1949; Moldenke, *Phytologia* 19: 19 & 43. 1969.

ERIOCAULON GUYANENSE Körn.

Additional bibliography: Fyson, Journ. Indian Bot. 2: 320. 1921; Moldenke, Alph. List Cit. 3: 975 (1949) and 4: 1203. 1949; Moldenke, *Phytologia* 19: 43. 1969.

The V. C. de Miranda 3072, distributed as "Eriocaulon aff. E. guyanense", is actually E. stramineum Körn.

ERIOCAULON HAMILTONIANUM Mart.

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 68. 1899; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 46. 1930; Moldenke, *Phytologia* 19: 43—44. 1969; M. A. Rau, Bull. Bot. Surv. India 10, Suppl. 2: 84. 1969.

ERIOCAULON HETEROCHITON Körn.

Additional & emended bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 70 & 79. 1899; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 49. 1930; Moldenke, *Phytologia* 19: 43. 1969.

ERIOCAULON HETEROGYNUM F. Muell.

Additional bibliography: Moldenke, *Phytologia* 19: 66 & 68. 1969.

The "R. Br., Fl. Nov. Holl. 1: 38" reference sometimes cited for this taxon appears to be erroneous.

ERIOCAULON HETEROLEPIS Steud.

Additional & emended bibliography: Körn. in Miq., *Prol. Fl. Iap.* 326. 1867; Fyson, *Journ. Indian Bot.* 2: 316 & 320 (1921) and 3: 16. 1922; Moldenke, *Phytologia* 19: 46. 1969; Moldenke, *Biol. Abstr.* 50: 6336. 1969.

Additional citations: INDIA: Kerala: Stocks, Law, &c. s.n. (Br).

ERIOCAULON HEUDELOTII N. E. Br.

Additional bibliography: Moldenke, *Phytologia* 19: 68 (1969) and 19: 246. 1970.

The Jaeger 5247, distributed as E. heudelotii, is actually E. welwitschii Rendle.

ERIOCAULON HILDEBRANDTII Körn.

Additional & emended bibliography: Ruhl. in Engl., *Bot. Jahrb.* 27: 68 & 73. 1899; Ruhl. in Engl. & Prantl, *Nat. Pflanzenfam.*, ed. 2, 15a: 41, 44, & 49. 1930; Moldenke, *Phytologia* 19: 68. 1969.

ERIOCAULON HONDOENSE Satake

Additional bibliography: Moldenke, *Phytologia* 19: 68—69 (1969) and 19: 249 & 250. 1970.

Additional citations: WESTERN PACIFIC ISLANDS: JAPAN: Honshiu: Togasi 1101 (N).

ERIOCAULON HOOKERIANUM Stapf

Additional & emended bibliography: H. N. Ridl., *Fl. Mal. Penins.* 5: 134 & 135, fig. 218. 1925; Moldenke, *Phytologia* 19: 69 & 88. 1969.

Emended illustrations: H. N. Ridl., *Fl. Mal. Penins.* 5: 134, fig. 218. 1925.

Ridley (1925) says of this species that in the Malay Peninsula it is found on "high mountains among rocks. Pahang, Gunong Tahan on Gunong Riang and the summit of Gunong Tahan at 7100 ft. altitude on dry rocky spots. Distrib. Mount Kinabalu in Borneo". Hoogland & Schodde found it growing in seepage along small creeks at 7500 feet altitude, describing its inflorescence as "white", and reporting for it the common name "abunink".

Additional citations: MELANESIA: NEW GUINEA: Northeastern New Guinea: Hoogland & Schodde 6804 (Ca—1219925).

ERIOCAULON HUMBOLDTII Kunth

Additional bibliography: Moldenke, *Alph. List Cit.* 1: 27 & 132 (1946), 2: 352 (1948), 3: 821, 936, & 975 (1949), and 4: 984 &

985. 1949; Van Donselaar, Meded. Bot. Mus. Rijksuniv. Utrecht 306: 397 & 402. 1968; Moldenke, Phytologia 19: 70, 105, & 109. 1969.

The Rob. Schomburgk 285, distributed as E. humboldtii, is actually a cotype collection of E. tenuifolium Klotzsch.

Additional citations: BRAZIL: Goiás: Irwin, Maxwell, & Wasshausen 21355 (N).

ERIOCAULON INFIRMUM Steud.

Synonymy: Eriocaulon gracile Mart. in Wall., Pl. Asiat. Rar. 3: 29. 1832 [not E. gracile Bong., 1831]. Eriocaulon sexangulare Heyne ex Wall., Numer. List 207, in syn. 1832 [not E. sexangulare Auct., 1903, nor Burm. f., 1826, nor Fyson, 1959, nor L., 1753, nor Mart., 1893, nor Ridl., 1959, nor Willd., 1841]. Eriocaulon sericans Hook. f., Fl. Brit. Ind. 6: 577. 1893 [not E. sericans Heyne, 1832, nor Mart., 1893]. Eriocaulon gracile typica Fyson, Journ. Indian Bot. 2: 264. 1921. Eriocaulon gracile Heyne ex Moldenke, Known Geogr. Distrib. Erioc. 35, in syn. 1946.

Additional & emended bibliography: Kunth, Enum. Pl. 3: 558—559. 1841; Körn., Linnaea 27: 655. 1856; Körn. in Miq., Prol. Fl. Iap. 328. 1867; Moldenke, Alph. List Cit. 4: 1128. 1949; Van Royen, Nov. Guin., new ser., 10: 23, 38—39, & 44. 1959; Moldenke, Phytologia 19: 42 & 44 (1969) and 19: 237. 1970.

Van Royen (1959) has correctly pointed out that the name, E. gracile Mart., which I have hitherto used for this taxon in this series of notes, must be abandoned in favor of E. infirmum Steud. However, he dates the Hooker synonym as "1894", but its correct date of publication is 1893. The E. sericans accredited to Heyne and to Martius are both synonyms of E. wightianum Mart., while E. gracile Bong. is now known as Syngonanthus gracilis var. olivaceus Ruhl.

Eriocaulon sexangulare L. is a valid species, but the homonyms attributed to "Auct." and to Martius are synonyms of E. cinereum R. Br., those credited to Fyson and to Willdenow are E. willdenovianum Moldenke, and that credited to Burman is E. minimum Lam.

ERIOCAULON INFIRMUM var. KURZII (Fyson) Moldenke, comb. nov.

Synonymy: Eriocaulon gracile var. kurzii Fyson, Journ. Indian Bot. 2: 264, pl. 20. 1921.

Additional bibliography: Moldenke, Phytologia 18: 102. 1969.

This taxon has hitherto been discussed by me under the untenable name, E. gracile var. kurzii Fyson

ERIOCAULON INFIRMUM var. PUBERULENTUM (Moldenke) Van Royen

Synonymy: Eriocaulon gracile var. puberulentum Moldenke, Phytologia 4: 128. 1952.

Additional bibliography: Van Royen, Nov. Guin., new ser., 10: 23, 38—39, & 44, fig. 3 K. 1959; Moldenke, Phytologia 18: 102—103. 1969.

Illustrations: Van Royen, Nov. Guin., new ser., 10: 32, fig. 3 K. 1959.

This taxon has hitherto been discussed by me under the untenable name, *E. gracile* var. *puberulentum* Moldenke. Van Royen (1959) has given an amplified description of this variety: "Herb up to 13 cm. Leaves lanceolate-linear, 1.3—2 by 0.1—0.15 cm, long acutely acuminate, 4—7-nerved, fenestrate, glabrous except for long white hairs in the axil. Peduncles 2.5—13 cm, 5-ribbed, twisted, glabrous, sheath 1—2.5 cm, glabrous. Heads obovoid to semiglobose, 2—3 by 2—3 mm, involucre bracts obovate or squamiform, c. 1.5 by 1.2 mm, obtuse, with few short white hairs in the apical half, floral bracts obovate, c. 1.5 by 1 mm, apiculate, blackish in the upper part and the same area covered with short white or yellowish hairs at outside; receptaculum with long silky white hairs. ♂ Flowers: sepals 3, tubiformly united, the two lateral ones mutually united in the basal part only, the lateral ones boat-shaped, c. 1.5 mm long, rounded at apex, blackish in the upper half, at outside with short white hairs near apex and along crest in the upper third, median sepal lanceolate, c. 1.5 by 0.5 mm, acute or sub-acute, with a few white hairs at apex, blackish in the apical fourth; petals 3, tubiformly united, with a few white hairs at apex, the free lobes of the lateral ones smaller than the median one; stamens 6, the epipetalous longer than the alternipetalous, anthers very slightly blackish. ♀ Flowers: sepals 3, free, lateral ones boat-shaped, c. 1.5 mm long, obtuse, at outside with white hairs mainly at apex and along the apical part of the crest, blackish in the upper part, median sepal spatulate, c. 1.5 by 0.3 mm, subacute, with white hairs at apex, blackish in the apical half; petals 3, unequal, with white hairs along the margin and on either side of the apical part except for the extreme tip; ovary 3-celled; style 1 with 3 branches. Seeds globose or ellipsoid, c. 0.5 mm long, with small downwards directed hairs, dark brown. Distribution. Endemic. Local distribution. South Papua, near Lake Daviumbu (Brass 7822). Ecology. On wet grass plains in seasonal areas at low altitudes."

ERIOCAULON INSULARE Ruhl.

Additional bibliography: Moldenke, Alph. List Cit. 1: 63, 186, & 187 (1946) and 2: 651. 1948; Moldenke, Phytologia 18: 243. 1969; Moldenke, Biol. Abstr. 50: 7436 & 7996. 1969.

ERIOCAULON INTERMEDIUM Körn.

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 66. 1899; Moldenke, Phytologia 19: 70 (1969) and 19: 234, 236, 237, & 244. 1970.

ERIOCAULON JAPONICUM Körn.

Additional & emended bibliography: Körn. in Miq., Prol. Fl. Iap. 326—327. 1867; Miq., Cat. Mus. Lugd. Bat. 108. 1870; Maxim., Diagn. Pl. Nov. Asiat. 8: 7, 17, & 24. 1893; Moldenke, Phytologia 19: 71. 1969.

ERIOCAULON JOHNSTONII Ruhl.

Additional & emended bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 72, 81, & 82. 1899; Moldenke, Phytologia 18: 247 & 433. 1969.

ERIOCAULON KINABALUENSE Van Royen

Additional bibliography: Moldenke, Phytologia 19: 71--72. 1969.

The Clemenses describe this plant as densely cespitose, growing on wet, cold, bare, windswept summits.

ERIOCAULON KIUSIANUM Maxim.

Additional & emended bibliography: Maxim., Diagn. Pl. Nov. Asiat. 8: 7, 16, & 22--24. 1893; Moldenke, Phytologia 19: 72. 1969.

The type of this species was collected by Carl Johan Maximowicz "in principatu Simabara", Kiusiu, Japan, on September 20, 1863. He notes that "Flores capitulae E. alpestris, a quo tamen foliis crasse nec pellucidis nec fenestratis statim distinguitur".

ERIOCAULON KLOTZSCHII Moldenke

Additional bibliography: Moldenke, Phytologia 19: 72, 101, & 102. 1969; Moldenke, Biol. Abstr. 50: 6336. 1969; Anon., Biol. Abstr. 50 (12): BASIC S.69. 1969.

The Rob. Schomburgk 107, type collection of this species, is actually a mixture, at least in some herbaria, with E. tenuifolium Klotzsch.

ERIOCAULON KLOTZSCHII var. PROLIFERUM (Moldenke) Moldenke

Additional bibliography: Moldenke, Phytologia 19: 72. 1969; Moldenke, Biol. Abstr. 50: 6336. 1969; Anon., Biol. Abstr. 50 (12): BASIC S.69. 1969.

ERIOCAULON KÖRNICKIANUM Van Heurck & Muell.-Arg.

Additional bibliography: Moldenke, Alph. List Cit. 1: 262 (1946), 3: 789 (1949), and 4: 989. 1949; Moldenke, Phytologia 18: 251--253, 370, 380, & 381 (1959) and 19: 232. 1970.

ERIOCAULON KUNTHII Körn.

Additional bibliography: Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 49. 1930; Moldenke, Alph. List Cit. 3: 731 & 732. 1949; Moldenke, Phytologia 19: 72. 1969.

ERIOCAULON LANCEOLATUM Miq.

Additional bibliography: Moldenke, Phytologia 19: 73. 1969.

The Strachey & Winterbottom 2, determined as E. lanceolatum by Ruhland in the herbarium of the Jardin Botanique de l'Etat at Brussels, is actually E. truncatum Hamilt.

ERIOCAULON LATIFOLIUM J. Sm.

Additional bibliography: H. Hess, Bericht. Schweiz. Bot. Gesell.

65: 133--137. 1955; Moldenke, *Phytologia* 19: 73. 1969.

The E. latifolium credited to Nees (1900) is actually a synonym of E. woodii N. E. Br.

ERIOCAULON LEUCOMELAS Steud.

Additional bibliography: Rao & Kumari, *Bull. Bot. Surv. India* 9: 110. 1967; Kammathy, Rao, & Rao, *Bull. Bot. Surv. India* 9: 232. 1967; Moldenke, *Phytologia* 19: 74--75, 94, & 100 (1969) and 19: 232. 1970.

Rao & Kumari (1967) state that this species is "common" on laterite soil, flowering in September, and cite their no. 35646 from Andhra Pradesh, India; Kammathy and his associates (1967) describe it as "occasional in swampy area" and cite Barnes s.n. and their number 73807 from Mysore.

ERIOCAULON LIGULATUM (Vell.) L. B. Sm.

Additional bibliography: Moldenke, *Alph. List Cit.* 2: 460 & 598. 1948; Angely, *Fl. Paran.* 16: 51. 1960; Moldenke, *Phytologia* 19: 75. 1969.

ERIOCAULON LINEARE Small

Additional bibliography: Moldenke, *Alph. List Cit.* 1: 42, 139, 242, 257, 293, & 296 (1946), 2: 460, 461, & 513 (1948), 3: 756 & 778 (1949), and 4: 1125, 1135, 1173, & 1178. 1949; Moldenke, *Phytologia* 19: 75 (1969) and 19: 232. 1970.

Godfrey collected this plant on "peaty shores of pond" and "in about 10 inches of water, the substrate very loose soft mucky silt", fruiting in November. Tomlinson found it "In wet margin of lake, wholly inundated except for flowers, in association with Mayaca", flowering and fruiting in June.

The Gillis 6464, distributed as E. lineare, is actually E. compressum Lam.

Additional citations: FLORIDA: Highlands Co.: Tomlinson 10-6-63 J (Ft--282). Leon Co.: R. K. Godfrey 62886 (Ft--284), 63237 (Ft--283).

ERIOCAULON LINEARIFOLIUM Körn.

Additional bibliography: Moldenke, *Alph. List Cit.* 2: 627 (1948) and 4: 1296. 1949; Moldenke, *Phytologia* 19: 75. 1969.

Additional citations: BRAZIL: Goiás: Heringer 11264 (Rf).

ERIOCAULON LIVIDUM F. Muell.

Additional bibliography: H. Hess, *Bericht. Schweiz. Bot. Gesell.* 65: 150. 1955; Moldenke, *Phytologia* 18: 269. 1969.

ERIOCAULON LONGIPETALUM Rendle

Additional bibliography: Ruhl. in Engl. & Prantl, *Nat. Pflanzenfam.*, ed. 2, 15a: 49. 1930; Moldenke, *Phytologia* 19: 76. 1969.

ERIOCAULON LUZULAEFOLIUM Mart.

Additional & emended bibliography: Schnitzl., *Iconogr.* 1: pl.

46, fig. 2 & 5. 1845; Steud., Syn. Pl. Glum. 2 [Cyp.]: 270. 1855; Körn., Linnaea 27: 636. 1856; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 1, 341. 1864; Ruhl. in Engl., Bot. Jahrb. 27: 66. 1899; Moldenke, Alph. List Cit. 2: 461 & 558 (1948) and 4: 1102 & 1189. 1949; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 2, 341. 1964; Datta & Majumdar, Bull. Bot. Soc. Bengal 20: 38. 1966; Tingle, Check List Hong Kong Pl. 54. 1967; Subba Rao & Kumari, Bull. Bot. Surv. India 9: 188--189. 1967; Moldenke, Phytologia 19: 76 (1969) and 19: 246. 1970.

Tingle (1967) reports this species from Hongkong, where it is known as the "small pipewort". Datta & Majumdar (1966) report that it flowers from November to January in Bengal. Subba Rao & Kumari (1967) state that "This species is near to E. quinquangulare Linn. but differs in having green leaves, green sheaths, longer scapes, non reflexing involucre bracts and glabrous petals in male flowers. It is also allied to E. thwaitesii Koern. but can be distinguished by its longer scapes and oblanceolate petals in female flowers which lack long hairs at the base." They cite Subba Rao 21758 from Andhra Pradesh, India, where they found it to be "common" at 1125 meters altitude. They give its overall distribution as "Central Himalayas, Nepal, Assam, Silhet, Bengal and Burma" and comment that "Hook. f....gives the distribution as throughout India but according to Fyson....this species is restricted to Nepal, Assam, Bengal and Upper Burma."

The E. luzulaefolium var. minus of Martius is E. truncatum Hamilt.

ERIOCAULON MAGNIFICUM var. GOYAZENSE Moldenke

Additional bibliography: Moldenke, Phytologia 19: 77. 1969.

Additional citations: BRAZIL: Goiás: Heringer & Lima 11717 (Rf--isotype).

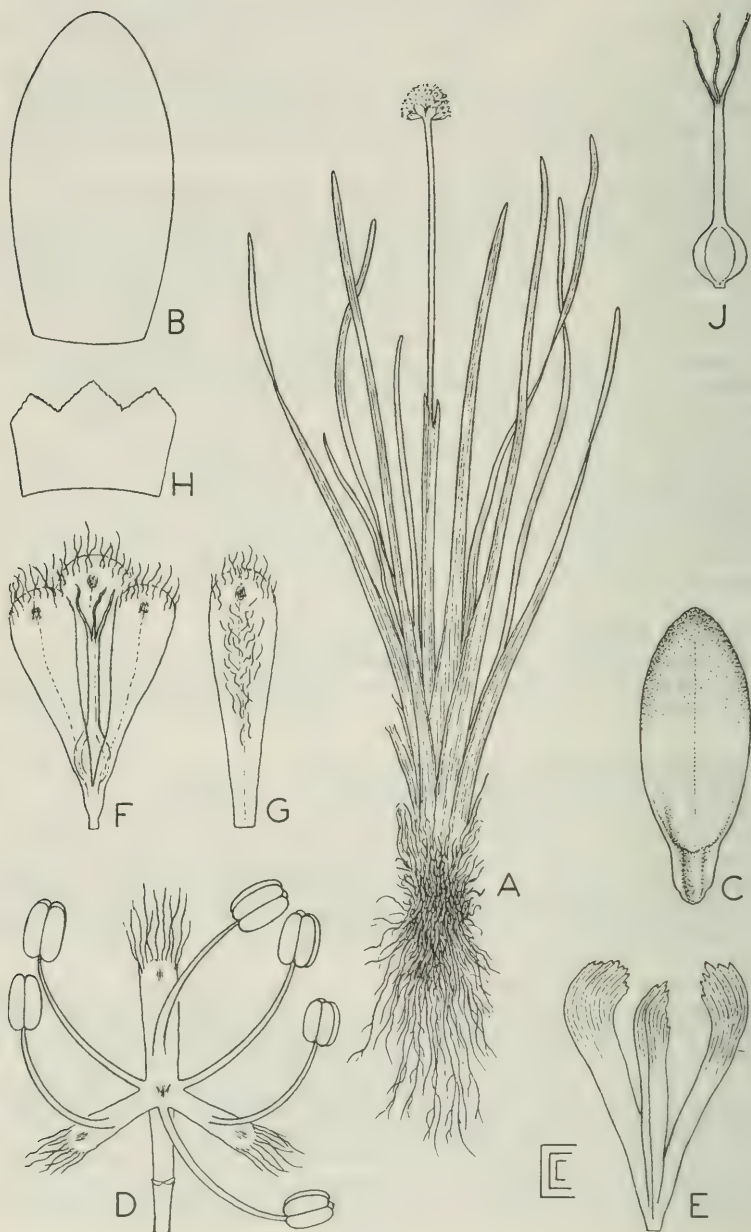
ERIOCAULON MALAISSEI Moldenke, sp. nov.

Bibliography: Moldenke, Phytologia 19: 16. 1969.

Herba aquatica; caulo erecto; foliis erectis tenuibus atroviridibus brunnescentibus 10--15 cm. longis, ad basin ampliatis albido-pellucidisque, usque ad apicem gradatim angustatis, ubique glabris; vaginis 6--6.5 cm. longis laxis glabris obscure fenestratiss, ad apicem bifidis; scapo solitario stramineo 11--12 cm. longo 6-costato glabro; capitulis hemisphaericis albidis ca. 8 mm. latis.

Aquatic herb; stem erect, 4--5 cm. long, completely covered by the sheathing leaves; leaves forming a basal rosette, erect, thin, weak, 10--15 cm. long, dark-green, brunnescent in drying, widely expanded and sheathing at the base and there whitish-pellucid, 2--3 mm. wide above the base and gradually narrowed to the bluntish apex or subacute apex, with numerous parallel veins, fenestrate under a handlens, very conspicuously so on the expanded base, closely overlapping at the base and completely hiding the stem, glabrous throughout; inflorescence solitary; sheath 6--6.5 cm. long, about 3 mm. wide, uniform, loose, with many parallel

Plate I



veins, more or less fenestrate under a handlens toward the base, glabrous, bifid at the apex, the two blades lanceolate-ovate, about 5 mm. long, slightly unequal, erect, attenuate-acute at the apex; scape single, stramineous, 11--12 cm. long, about 6-ribbed, glabrous; heads single, hemispheric, whitish, about 8 mm. wide; involucre bractlets firm, elliptic or slightly subobovate, about 3.1 mm. long and 1.5 mm. wide, obtuse at the apex, stramineous below, blackish toward the apex, glabrous; receptacular bractlets more narrowly elliptic, about 2.7 mm. long and 1 mm. wide, blunt at the apex; staminate florets: sepals 3, navicular-cucullate, connate at the base, about 2.5 mm. long, erose; stamens 6, 3 adnate to and 3 alternate with the 3 petals that are connate at the base, very conspicuously white-pilose at the apex, with a gland in the center near the apex; pistillate florets: petals 3, separate, obovate-spatulate, about 2.4 mm. long, 0.5--0.6 mm. wide, rounded or subtruncate at the apex and there very conspicuously white-pilose, with a small black gland at the center near the apex, the sepals united for most of their length, with just a small triangular apical portion free, about 0.9 mm. long in all; pistil about 2.5 mm. long; ovary globose, 0.5 mm. long and wide; stigmas 3. Plate I.

The type of this species was collected by François Malaisse (no. 4489) -- in whose honor it is named -- on the shore of Luanza River, about 5 km. from its source, in the Republic of Congo, at an altitude of 1580 meters, on August 3, 1966, and is deposited in my personal herbarium at Plainfield, New Jersey.

Explanation of Plate I:

A = Habit x 3/4; B = Involucre bractlet x15; C = Receptacular bractlet x15; D = Staminate floret, sepals removed x15; Staminate floret, sepals x15; F = Pistillate floret, sepals removed x15; G = Pistillate floret, petal x15; H = Pistillate floret, sepals x15; J = Gynoecium x15. Drawn by Charles C. Clare, Jr., November 1969.

Mr. R. D. Meikle has examined Malaisse 4489 (type of the species) and 6605, which I sent to the Royal Botanic Gardens at Kew for determination. According to a letter from my friend, Edgar Milne-Redhead, dated June 12, 1969, "he is of the opinion that the two Eriocaulons are conspecific, and that both are Eriocaulon antunesii Engl. & Ruhl. Unfortunately we do not have the type of this species at Kew, and cannot be quite certain of the identification, though everything in the description agrees with your plants. Mr. Meikle also notes that Eriocaulon stoloniferum Welw. ex Rendle is most probably synonymous with E. antunesii. Both species were described from Angolan (Huilla) material, and it is evident that the respective authors were unaware of each other's activities at the time when the species were described."

Actually, I have compared these two collections with an isotype of E. antunesii and find them very different.

Citations: REPUBLIC OF CONGO: Malaisse 4489 (Z--type).

ERIOCAULON MALAISSEI f. VIVIPARUM Moldenke, Phytologia 19: 16, hyponym (1969), f. nov.

Haec forma a forma typica speciei capitulis viviparis et caulis stoloniferis recedit.

This form differs from the typical form of the species in having its flower-heads conspicuously viviparous and in having an elongated basal stem which produces numerous leafy stolons.

The type of the form was collected by François Malaisse (no. 6005) seven km. west-southwest of Poste de Katohufa, at an altitude of 1630 meters, in the Republic of Congo, on November 7, 1968, and is deposited in my personal herbarium at Plainfield, New Jersey.

Citations: REPUBLIC OF CONGO: Malaisse 6005 (Rf--isotype, Z--type).

ERIOCAULON MANNII N. E. Br.

Additional bibliography: Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 49. 1930; Moldenke, Phytologia 18: 278. 1969.

ERIOCAULON MARGARETAE Fyson

Additional bibliography: Kammathy, Rao, & Rao, Bull. Bot. Surv. India 9: 232. 1967; Moldenke, Phytologia 18: 278--279. 1969.

Kammathy & his associates (1967) describe this plant as "rare in quiet pools" in Mysore, India, and cite their no. 80401.

ERIOCAULON MELANOCEPHALUM Kunth

Additional bibliography: Sauv., Fl. Cub. 163. 1871; Sauv., Anal. Acad. Ci. Habana 8: 49. 1871; Ruhl. in Engl., Bot. Jahrb. 27: 66. 1899; Moldenke, Alph. List Cit. 2: 352 & 650 (1948), 3: 805 & 975 (1949), and 4: 1143, 1144, & 1209. 1949; Moldenke, Phytologia 19: 77--78 (1969) and 19: 236. 1970.

ERIOCAULON MELANOCEPHALUM var. LONGIPES Griseb.

Additional bibliography: Sauv., Fl. Cub. 163. 1871; Sauv., Anal. Acad. Ci. Habana 8: 49. 1871; Moldenke, Alph. List Cit. 4: 1144. 1949; Moldenke, Phytologia 18: 301. 1969.

ERIOCAULON MERRILLII Ruhl.

Additional bibliography: Moldenke, Alph. List Cit. 2: 462 (1948), 3: 840 (1949), and 4: 1134, 1211, & 1259. 1949; Moldenke, Phytologia 19: 78 (1969) and 19: 246. 1970.

Bartlett describes this plant as having "heads bluish-white" and found it growing on high plateaus, at 1500 meters altitude, flowering in October. Material has been misidentified and distributed in herbaria under the name E. trilobum Buch.-Ham.

Additional citations: INDONESIA: GREATER SUNDA ISLANDS: Sumatra: Bünnemeijer 5203 (Ut--53014).

ERIOCAULON MESANTHEMOIDES Ruhl.

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 70 & 79. 1899; Moldenke, Alph. List Cit. 2: 424 (1948) and 3: 977. 1949; Moldenke, Phytologia 18: 303 (1969) and 19: 96. 1969.

ERIOCAULON MEXICANUM Moldenke

Additional bibliography: Moldenke, Alph. List Cit. 3: 830. 1949; Moldenke, Phytologia 18: 303 & 318. 1969.

ERIOCAULON MICROCEPHALUM H.B.K.

Additional bibliography: Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 49. 1930; Moldenke, Alph. List Cit. 1: 10, 28, & 32 (1946), 2: 370, 461, 580, & 642 (1948), 3: 660, 805, 830, 831, 848, 872, 898, & 962 (1949), and 4: 1076, 1148, & 1277. 1949; Moldenke, Phytologia 19: 78—79, 94, & 95. 1969.

Tomlinson found this plant growing in paramo vegetation, flowering in August.

Additional citations: COSTA RICA: San José: Tomlinson 6-VIII-65 A (Ft--285).

ERIOCAULON MINIMUM Lam.

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 85. 1899; Moldenke, Phytologia 19: 79 (1969) and 19: 243 & 255. 1970.

ERIOCAULON MINUTUM Hook. f.

Additional bibliography: Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 49. 1930; Moldenke, Phytologia 19: 79. 1969.

ERIOCAULON MIQUELIANUM Körn.

Additional & emended bibliography: Körn. in Miq., Prol. Fl. Iap. 326 & 327. 1867; Miq., Cat. Mus. Lugd. Bat. 109. 1870; Maxim., Diagn. Pl. Nov. Asiat. 8: 7, 9, & 16--19. 1893; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 44. 1930; Moldenke, Phytologia 19: 69 & 79 (1969) and 19: 250. 1970.

Maximowicz (1893) cites Albrecht s.n., Buerger s.n., Makino s.n., Siebold s.n., and three collections made by himself, all from Japan. He indicates that the species is common in swamps among Drosera rotundifolia and various Cyperaceae, flowering in September and October. He notes that "Inter nostra bracteis flores longe superantibus acuminatis statim cognitum, a Koernicke cum E. heterolepide Stend. ex India orientali comparatum".

ERIOCAULON MISERUM Körn.

Additional bibliography: Maxim., Diagn. Pl. Nov. Asiat. 8: 14. 1893; Ruhl. in Engl., Bot. Jahrb. 27: 66. 1899; Moldenke, Phytologia 19: 79—80. 1969.

ERIOCAULON MODESTUM Kunth

Additional bibliography: Moldenke, Alph. List Cit. 1: 106 (1946) and 3: 876. 1949; Moldenke, Phytologia 19: 80—81 (1969) and 19: 232. 1970.

Additional citations: BRAZIL: Minas Gerais: Irwin, Maxwell, & Wasshausen 19585 (N).

ERIOCAULON NANELLUM Ohwi

Additional bibliography: Moldenke, Phytologia 18: 322. 1969.

Additional citations: WESTERN PACIFIC ISLANDS: JAPAN: Honshiu: S. Suzuki s.n. [Sep. 24, 1951] (Se--141338), s.n. [Aug. 10, 1952] (Se--146902).

ERIOCAULON NANUM R. Br.

Additional & emended bibliography: R. Br., Prodr. Fl. Nov. Holl., pr. 1, 1: 254 (1810) and pr. 2, [Isis 1819:] 48. 1819; Moldenke, Phytologia 19: 82--83 & 94. 1969.

ERIOCAULON NAUTILIFORME H. Lecomte

Additional & emended bibliography: H. Lecomte, Not. Syst. 2: 215 (1912) and 2: 393. 1913; Moldenke, Phytologia 19: 83. 1969.

ERIOCAULON NEESIANUM Körn.

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 68. 1899; Fyson, Journ. Indian Bot. 2: 320. 1921; Moldenke, Phytologia 19: 83. 1969.

ERIOCAULON NEPALENSE Prescott

Additional & emended bibliography: Kunth, Enum. Pl. 3: 554--555. 1841; Körn. in Miq., Prol. Fl. Iap. 327. 1867; Moldenke, Alph. List Cit. 2: 618 (1948) and 3: 977. 1949; Moldenke, Phytologia 19: 83. 1969.

Kunth (1841), in his discussion of E. xeranthemum Mart., notes that "E. nepalensi et truncato proximum, licet involucrium radians".

ERIOCAULON NILAGIRENSE Steud.

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 66. 1899; Sebastine & Vivekanathan, Bull. Bot. Surv. India 9: 165 & 183. 1967; Moldenke, Phytologia 19: 83 (1969) and 19: 246. 1970.

Sebastine & Vivekanathan (1967) describe this plant as abundant at 1675 meters altitude in moist places of the extensive grasslands of Kerala, India, flowering in June, and cite their no. 16461.

ERIOCAULON NIPPONICUM Maxim.

Additional & emended bibliography: Maxim., Diagn. Pl. Nov. Asiat. 8: 5 & 9--10. 1893; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 49. 1930; Moldenke, Alph. List Cit. 2: 492 (1948) and 4: 1168, 1178, & 1288. 1949; Moldenke, Phytologia 19: 79 & 83 (1969) and 19: 250. 1970.

Maximowicz (1893) bases this species on three collections: (1) Bisset s.n. from somewhere in Japan, (2) Maximowicz s.n. from the vicinity of Yokohama, and (3) Savatier 1362 from wet places at Hakone, Japan. He describes the plant as being rather frequent about Yokohama, flowering there in September. He notes "Habitus E. Miqueliani, sed involucrium brevius phyllis obtusis et flores dimeri".

ERIOCAULON NOVOGUINEENSE Van Royen

Additional bibliography: Moldenke, *Phytologia* 19: 83—84. 1969.

Collectors have found this plant growing at altitudes of 7000 to 11,050 feet, in open alpine places. Brass describes the leaves as stiff and fleshy, the flower-heads pale-brown, and the plant "common in closely packed masses on edge of lake and on marshy slopes".

Additional citations: MELANESIA: NEW GUINEA: Northeastern New Guinea: M. S. Clemens 5584 (N), 9368 (N).

ERIOCAULON NUDICUSPE Maxim.

Synonymy: Eriocaulon, sp. dubia Miq., *Cat. Mus. Lugd. Bat.*

146. 1870. Eriocaulon sp. incerta Miq. apud Maxim., *Diagn. Fl. Nov. Asiat.* 8: 19, in syn. 1893.

Additional & emended bibliography: Miq., *Cat. Mus. Lugd. Bat.* 146. 1870; Maxim., *Diagn. Fl. Nov. Asiat.* 8: 7 & 19—20. 1893; Moldenke, *Phytologia* 19: 84. 1969.

Maximowicz (1893) seems to base this species on three collections: "E. sp. incerta Miq. cat. mus. Lugd. Bat. 146 et 109 leg. Siebold. Japonia (hb. Ito. Keiskei! vol. II. n. 61. jap. Tsiku tōsō in Mus. Lugd. Bat.)"

ERIOCAULON ODORATUM Dalz.

Additional bibliography: Ruhl. in Engl., *Bot. Jahrb.* 27: 68. 1899; Ruhl. in Engl. & Prantz, *Nat. Pflanzenfam.*, ed. 2, 15a: 46. 1930; Moldenke, *Phytologia* 19: 84 (1969) and 19: 248. 1970.

ERIOCAULON OFFICINALE Körn.

Additional bibliography: Körn. in Miq., *Prol. Fl. Iap.* 327. 1867; Ruhl. in Engl. & Prantl, *Nat. Pflanzenfam.*, ed. 2, 15a: 50. 1930; Moldenke, *Phytologia* 18: 360—361. 1969.

ERIOCAULON PALLIDUM R. Br.

Additional & emended bibliography: R. Br., *Prodr. Fl. Nov. Holl.*, pr. 1, 1: 254 (1810) and pr. 2, [Isis 1819:] 47—48. 1819; Ruhl. in Engl., *Bot. Jahrb.* 27: 68. 1899; Moldenke, *Phytologia* 18: 365. 1969.

ERIOCAULON PALUSTRE Salzm.

Additional bibliography: Körn. in Miq., *Prol. Fl. Iap.* 327. 1867; Ruhl. in Engl. & Prantl, *Nat. Pflanzenfam.*, ed. 2, 15a: 44. 1930; Moldenke, *Phytologia* 19: 85. 1969.

ERIOCAULON PARADOXUM Moldenke

Additional bibliography: Moldenke, *Alph. List Cit.* 2: 370 (1946) and 4: 1255. (1949); Moldenke, *Phytologia* 18: 367—368 (1969) and 19: 23. 1969.

ERIOCAULON PARKERI B. L. Robinson

Additional & emended bibliography: Britton & Br., *Illustr. Fl.*, ed. 2, pr. 1, 1: 454, fig. 1141 (1913) and 3: 575 (1913), pr. 2,

1: 454, fig. 1141 (1936) and 3: 575 (1936), and pr. 3, 1: 454, fig. 1141 (1943) and 3: 575. 1943; Moldenke, Alph. List Cit. 1: 43, 57, 60, 94, 115, 122, 164, 170, 178, 197, 199, 248, 270, 292, 295, & 296. 1946; Britton & Br., Illustr. Fl., ed. 2, pr. 4, 1: 454, fig. 1141 (1947) and 3: 575. 1947; Moldenke, Alph. List Cit. 2: 361, 412, 449, 455, 459--461, 476, 477, 492, 494, 496, 524, 529, 568, & 641 (1948), 3: 671, 699, 707, 709, 722, 736, 741, 753, 754, 773, 794, 805--807, 822, 870, 877, & 964 (1949), and 4: 985, 1085, 1119, 1135, 1141, 1168, 1176, 1189, 1198, 1204, 1222, 1227, 1252, & 1296. 1949; Lehr, Bull. Torr. Bot. Club 96: 721. 1969; Moldenke, Phytologia 19: 86 (1969) and 19: 232. 1970.

Emended illustrations: Britton & Br., Illustr. Fl., ed. 2, pr. 1, 1: 454, fig. 1141 (1913), pr. 2, 1: 454, fig. 1141 (1936), pr. 3, 1: 454, fig. 1141 (1943), and pr. 4, 1: 454, fig. 1141. 1947.

Lehr (1969) states that this species has not been seen in Rockland County, New York, for the past fifteen years.

ERIOCAULON PARVUM Körn.

Additional & emended bibliography: Körn. in Miq., Prol. Fl. Iap. 327. 1867; Miq., Cat. Mus. Lugd. Bat. 109. 1870; Maxim., Diagn. Pl. Nov. Asiat. 8: 6, 10, 11, & 14--16. 1893; Moldenke, Phytologia 19: 86 & 104. 1969.

Maximowicz (1893) cites for this species only the original collection and Makino s.n. from Shikoku, Japan. He comments: "E. nostratibus E. sexangulare proximum, ceterum ab autore E. trilobo Ham. approximatum. A priore, quocum statura et habitu omnino convenit, statim discernitur capitulis nigrescentibus dorso bractearum albo-villosulis". Obviously his concept of E. sexangulare is what we now know as E. cinereum R. Br.

ERIOCAULON PELLUCIDUM Michx.

Additional bibliography: N. L. Britton, Man., pr. 1, 237 (1901), pr. 2, 237 (1902), pr. 3, 237 (1905), and pr. 4, 237. 1907; Britton & Br., Illustr. Fl., ed. 2, pr. 1, 1: 454, fig. 1140 (1913) and 3: 575 & 625 (1913), pr. 2, 1: 454, fig. 1140 (1936) and 3: 575 & 625 (1936), and pr. 3, 1: 454, fig. 1140 (1943) and 3: 575 & 625. 1943; Moldenke, Alph. List Cit. 1: 4, 6, 8, 11, 15, 18, 19, 21, 29--35, 38, 40--43, 46, 56, 59, 61, 63, 71, 82, 88, 90, 91, 94, 98, 99, 104, 107, 109, 111, 112, 115, 118, 122, 123, 129, 130, 139, 142, 143, 148, 149, 152, 153, 160, 163, 169, 174, 176, 177, 182, 192--194, 197, 199, 200, 204--206, 209, 212--214, 220, 224--226, 229, 235, 239, 242, 244, 245, 247--249, 255, 257, 262, 270, 271, 276--284, 287, 288, 290, & 292--296. 1946; Britton & Br., Illustr. Fl., ed. 2, pr. 4, 1: 454, fig. 1140 (1947) and 3: 575 & 625. 1947; Moldenke, Alph. List Cit. 2: 404, 406, 412, 413, 449, 453, 455, 460, 461, 473, 476--478, 480, 481, 492--494, 496, 506, 507, 514, 524, 530, 536, 538, 555, 568--570, 580, 581, 583, 585, 587, 609, 610, 614, 617, 630, 631, 634, 638, & 641 (1948), 3: 671, 698--700, 706, 707, 713, 719, 721, 722, 728, 738--740, 743--745, 750, 752--754, 760, 771--773, 783, 794, 800, 803, 806, 807, 811, 812, 823, 827, 828, 832, 842,

843, 852, 858, 870, 877, 878, 880, 890—892, 900, 911, 916, 926, 927, 931, 941, 948, 969, 971—973, 976, & 977 (1949), and 4: 986, 987, 997, 998, 1001, 1002, 1004, 1012, 1015, 1016, 1081, 1084, 1097—1099, 1111, 1112, 1118, 1119, 1121, 1123, 1125, 1127, 1135—1137, 1140, 1141, 1145, 1151, 1155, 1162, 1167—1169, 1173, 1176—1178, 1180, 1181, 1189, 1191, 1192, 1197—1199, 1203, 1204, 1209—1211, 1217, 1218, 1221—1223, 1125—1227, 1229, 1232, 1235, 1237, 1239, 1240, 1244, 1246, 1247, 1251, 1252, 1255, 1260, 1261, 1289, 1292, 1294, 1296, & 1297. 1949; Moldenke, Biol. Abstr. 50: 6336. 1969; G. W. Prescott, How to Know Aquat. Pl. 133, 134, & 164, fig. 146. 1969; Moldenke, Phytologia 19: 86—87, 101, 102, 105, & 109 (1969) and 19: 230. 1970.

Additional & emended illustrations: Britton & Br., Illustr. Fl., ed. 2, pr. 1, 1: 454, fig. 1140 (1913), pr. 2, 1: 454, fig. 1140 (1936), pr. 3, 1: 454, fig. 1140 (1943), and pr. 4, 1: 454, fig. 1140. 1947; G. W. Prescott, How to Know Aquat. Pl. 133, fig. 146. 1969.

Moore says that this species is "common in most of our lakes and rivers, stems up to a foot or so depending on depth of water" and reports the vernacular name "white buttons" in Ontario.

Additional citations: ONTARIO: County undetermined: M. I. Moore s.n. [Deep River, August 23, 1963] (Ft—6288).

ERIOCAULON PICTUM Fritsch

Additional & emended bibliography: H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 138—145 & 157, pl. 8, fig. 3, 4, 7, & 8. 1955; Moldenke, Phytologia 18: 388—391. 1969.

ERIOCAULON PILIFLORUM Ruhl.

Additional & emended bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 71 & 80—82. 1899; Moldenke, Phytologia 18: 391—392. 1969.

ERIOCAULON POLYCEPHALUM Hook. f.

Additional bibliography: Ellis, Swaminathan, & Chandrabose, Bull. Bot. Surv. India 9: 15. 1967; Moldenke, Phytologia 18: 395—396 & 435 (1969) and 19: 75. 1969.

Ellis & his associates (1967) cite their no. 18616 from Kerala, India.

ERIOCAULON PSEUDOCOMPRESSUM Ruhl.

Additional bibliography: Sauv., Fl. Cub. 163. 1871; Moldenke, Alph. List Cit. 1: 3 & 186 (1946), 2: 651 (1948), and 4: 1144 & 1304. 1949; Moldenke, Phytologia 18: 424. 1969.

In Sauvalle's work (1871) this plant is definitely misidentified as E. gnaphalodes Michx. — the binomial is not published there by Sauvalle as a new binomial as claimed by Ruhland (1900). Also, according to the late Dr. J. H. Barnhart, the date of publication of this part of Sauvalle's work was 1871, not "1868" as claimed by some authors.

BOOK REVIEWS

Alma L. Moldenke

"READINGS IN CONSERVATION ECOLOGY" edited by George W. Cox, xii & 595 pp., illus., Appleton-Century-Crofts, Publishers, New York, N. Y. 10016. 1969. \$4.96 paperback.

This newer orientation of both conservation and ecology, separately and jointly, developed from the realization that policy and practice of the former must be soundly based on the latter, and that the latter deals with dynamic ecosystems that man must actively manage if he wishes to perpetuate some desired condition. Sound ecological techniques must be used from now on if man is to avoid facing near (or possibly full) destruction from his previous gluttonous mismanagement.

This book is planned to complement a semester course in conservation for students with a minimum of a year's training in biology or actually biology majors. Because of the excellent choice and range of papers it will prove a real enrichment for such a course. There is so much of value in so many of these papers with ideas and information overlapping that it was a grave oversight not to have added a detailed index.

The 39 papers deal with the ecosystem approach to conservation problems related to ecosystem energy flow, control of wildlife populations and undesirable species, management of vegetation, human populations and food resources; problems relating to ecosystem nutrient cycle processes with pollution of pesticides, radioisotopes, air, eutrophication and with sustained use - management of aquatic and terrestrial ecosystems and weather control. The last paper is about the outlook for the future, taken from way back in 1933, but still pertinent.

The far-seeing Aldo Leopold stated therein: "The swampy forests of Caesar's Gaul were utterly changed by human use -- for the better. Moses' land of milk and honey was utterly changed -- for the worst. We now decipher these reactions retrospectively. What could possibly be more important than to foresee and control them?"

"We of the machine age admire ourselves for our mechanical ingenuity; we harness cars to the solar energy impounded in carboniferous forests; we fly in mechanical birds; we make the ether carry our words or even our pictures. But are these not....mere parlor tricks compared with our utter ineptitude in keeping land fit to live upon?.....If our system of land use happens to be self-perpetuating, we stay. If.....self-destructive, we move, like Abraham, to pastures new." So few new pastures are now left for tomorrow!

"HOW TO KNOW THE LICHENS" by Mason E. Hale, vii & 226 pp., illus., William C. Brown Company, Dubuque, Iowa 52001. 1969. \$3.75 cloth-bound, \$3.00 spiral paper-bound.

This new member of the pictured-key series is even easier for the amateur or professional field naturalist and for the lichen student to use than the skilled author's recent book from the Smithsonian Institution's press. It deals with all but the little studied but numerous crustose lichens from the boreal forest areas of Canada through Florida and Baja California.

The last illustration in the book is figure 428 in the cleverly combined index and pictured glossary. This number is almost doubled when the geographic distribution maps are considered. These line drawings and photographs are a major achievement because lichens seem to be inherently difficult to picture.

The keys (avoiding involved chemical testing) and species descriptions are well written, as is the helpful introduction. There is a good annotated bibliography.

"HOW TO KNOW THE AQUATIC PLANTS" by G. W. Prescott, viii & 171 pp., illus., William C. Brown Company, Dubuque, Iowa 52001. 1969. \$3.25 cloth-bound, \$2.50 paper-bound.

This other recent publication in the Picture-Key Nature Series will also prove useful, but is not as carefully prepared because words are misspelled (as yellow on p. viii, chloroplasts and Myriophyllum twice on p. 4), punctuation is ignored (as comma after Isoetes on p. 4), indexing is inaccurate (as delta potato on p. 128 recorded for p. 127), classification is confused (as III and IV on p. viii), and the characteristically recognizable illustrations (except for fig. 148) give no evidence of proportionate size and often omit details of venation. The definition of a species could have been improved by the omission of "identical" and the addition of "intra-breeding". A little more time and care would have resulted in considerable improvement.

There is a well selected list of useful references and a check list by families of the aquatic genera. The keys work well for the 165 genera of the aquatic and semi-aquatic plants in the United States -- which is more than half of all reported. Under these genera are the illustrations, often with species named, special notes and geographic distribution.

The price is pleasantly reasonable, as is true for the whole series.

Some adaptation should be made so that the free ends of the wire in the spiral binding of these books are made less prone to catch onto field jacket pockets, sweater sleeves, etc.

"PERSPECTIVES IN ECOLOGICAL THEORY" by Ramón Margalef, viii & 111 pp., illus., University of Chicago Press, Chicago 60637 and London W.C.1. 1968.

This is a little, but far from slight, book that perpetuates four important lectures presented at the university in 1966. The author's purpose was to develop a theoretical superstructure for the biology of ecosystems.

In the first lecture he deals with ecosystems as cybernetic ones concerned with control and communication in systems formed by living organisms and their artifacts. The component elements, existing in many different states, are linked by reciprocal influences into feedback loops that may be negative (stabilizing) or positive (disruptive). In natural cybernetic systems finality is equated with persistence. Instead of the "one species, one niche" concept, Margalef considers that the only operational definition of niche covers "competing species using the same resource or are used by the same piece of the ecosystem." The competition is the positive result of the combination of two parallel negative feedback circuits. Biomass is equated with amount of information cybernetically.

The second lecture analyzes ecological succession and exploitation by man. He prefers to consider river plankton at low maturity rather than maximum or climax which he limits to an asymptotic state. River plankton is exploited by the benthos. The most mature vegetation is the forest type, but the most mature ecosystem must maintain a higher ratio of animal to plant biomass as in the herded grasslands where vegetation is kept rejuvenated and exploitable by grazing.

The third lecture is on pelagic ecosystems to which the author has devoted years of research. Because they are subject to natural exploitation and turbulence this maturity is kept low. Neither diatoms nor dinoflagellates serve as good indicators of species diversity but pigment ratio does correlate positively.

The fourth lecture, considering evolution in the frame of ecosystem organization, declares that the energy gates are where evolution occurs and its rate is dependent upon the efficiency of the gate and its direction is that of succession. Tempo and mode of evolution appear linked to basic properties of ecosystems in a most fundamental feedback circuit. All the most advanced examples of defense -- mimicry, biotic poisons, symbiosis, territorial behavior -- are more frequent in the most advanced ecosystems as in coral reefs, tropical rain forests, benthic fauna and cave life.

There is a good bibliography, a scanty index, two misspelled words -- "descendants" on p. 88 and "sinusoidal" on p. 7 -- and excellent reading.

"POLLUTION AND MARINE ECOLOGY" edited by Theodore A. Olson & Frederick J. Burgess, xvi & 364 pp., illus., Interscience Publishers - John Wiley & Sons., Inc., New York City, New York 10016, London, & Sydney. 1967. \$12.00.

Twenty-one papers by recognized workers are included in these "Proceedings of the Conference on the Status of Knowledge, Critical Research Needs, and Potential Research Facilities Relating to Ecology and Pollution Problems in the Marine Environment" held at the Texas A. & M. University Marine Laboratory in Galveston, Texas, in March of 1966.

Pertinent bibliographies are usually given, as well as the interesting discussions from the floor, and much is indexed. On p. 234 "areas" is misspelled; so is "possesses" on p. 289 and the generic name Sclerotonema.

Reading much like the successive chapters in a really good ecology text, the table of contents lists Part I for man's resources in the marine environment, including Emery's map of areas of high production of living matter in the world oceans; Part II for dynamics of the littoral marine community, with papers on intertidal populations off the coast of Oregon and on subtidal ecology of the southern California coast with its giant kelp (Macrocystis pyrifera) beds with "their multistoried structure" like a terrestrial rain forest; Part III for ecological systems stressing population dynamics, research needs and strategy, and evolution of digital simulation of natural animal communities wherein it is possible to model the behavior of water quality under various management schemes; Part IV for energy transfer as developed in Odum's excellently detailed paper on biological circuits and the marine systems of Texas, in Baabrud's fine paper on the influence of nutrient concentrations in primary production from his studies of the waters of the Odofjord where the alga Skeletonema costatum is the most frequent phytoplankton species and from his conclusion that control of algal growth is essential for pollution abatement and in the study of energy transfer as a quantitative baseline in the Chesapeake pollution studies;

Part V for interactions between the biota and the chemical-physical environment through the study of integration of environmental conditions by giant kelp off the coast of southern California under increasing turbidity, photosynthetic area loss due to but slight increase of commercial harvesting, through sedimentological effluent testings, and through use of ligand exchange techniques as a concentration and desalting tool for some organics; and Part VI for the tremendous number of parameters -- physical, chemical, biological, radiological -- of marine pollution, for the development of facile indicators and for the evaluating of monitoring systems.

"THE SONORAN DESERT -- ITS GEOGRAPHY, ECONOMY AND PEOPLE" by Roger Dunbar, xiii & 426 pp., illus., University of Arizona Press, Tucson, Arizona 85700. 1968. \$10.00.

This whole book makes for very interesting and informative reading which is enhanced by many excellently reproduced black and white photographs and also by many line-drawn maps all on

the same scale so as to interrelate easily so many different factors -- as plant and animal crops, weather conditions, tribes, vegetation, natural and irrigated water sources, railroads, etc. The text deals with desert land forms, climate, soils, vegetation, water, settlement from the aborigines' time to today, water resource development, the native and Mexican and American economy, and political factors. The appendix contains many rainfall and crop records. There is a fine bibliography and a useful index.

The term "Sonoran" was first used by botanists and then later applied commonly to the desert. Since desert size shrinks and expands marginally because of changes in the rainfall quantities, it is naturally difficult to delimit. The author accepts Shreve's boundaries except that he extends them southerly to Rio Culiacán including the arid littoral. This is a wedge-shaped area of 120,000 square miles on coastal outwash plain and low elevation basins above the Gulf of California with isolated block-faulted mountains within and many others peripherally. The rainfall in the eastern part does not exceed 15 inches annually and in the western part only half as much.

The single outstanding vegetational characteristic of this desert is its degree of varied arborescence. Its vegetational subregions are (a) lower Colorado valley desert whose extensive intermontane planes have little growth but low open stands of Larrea divaricata (creosote-bush) alone or mixed with Franseria dumosa (burro-bush or bur sage),

(b) Arizona upland desert of mountains with their rolling pediments and even sloping upper bajadas whose coarse soils hold more moisture and more large plants as the massive Cereus giganteus (saguaro cactus) and other cacti, the omnipresent Cercidium microphyllum (palo verde) and Prosopis juliflora (velvet mesquite),

(c) Gulf coast desert whose very dry edge of the state of Sonora has mainly just the Franseria-Larrea association punctuated by Pachycereus pringlei (giant cardón),

(d) Plains of Sonora of gently sloping outwashes and limited fickle rains due on St. John's Day in June and characterized by Lemaireocereus thurberi (organpipe cactus) and Lophocereus schottii (old man cactus),

(e) Foothills of Sonora of rugged mountains with lava flows and narrow valleys clothed with sizeable trees especially along the arroyo margins of Jatropha cordata, Fouquieria macdougalii (ocotillo), several tall cacti and desert palms,

(f) Thorn forest transition between the Yaqui and Mayo rivers joining subhumid, mangrove, thorn forests and littoral vegetation and getting its name from the Acacia cymbispina (espino) there.

It is surprising that the author used only the single volumed "Vegetation of the Sonoran Desert" written by Shreve and dated 1951 since there was available since 1964 the two-volumed "Vege-

tation and Flora of the Sonoran Desert" by Shreve and Wiggins.

"SECRETS OF PLANT LIFE" by Marcel Sire, translated, prepared and edited by M. B. E. Godward, 240 pp., illus., Viking Press, New York City, New York 10022. 1969. \$19.50.

This is a large Studio Book with over 400 very well printed exquisite color photographs selected from the naturalist-author's last 15 years of work. Beauty of form, design, color and size -- often magnified for our eyes' awakening -- just springs or glows from the pages.

The changing seasons as a unifying theme directs the arrangement of the contents. Revelant 20th century moodful poetry excerpts and simple accurate legends enhance the images created.

This book would make a wonderful gift to any person including yourself. It is especially appropriate for the botanist to have casually displayed in his office, lab or home as an avenue of communication for the non-botanist dropping by.

The original French version appeared in 1967.

"THE BOOK OF SPICES" by Frederic Rosengarten Jr., xiii & 489 pp., illus., Livingston Publishing Company, Wynnewood, Pennsylvania 19096. 1969. \$20.00.

The author was awarded in 1960 the "Order of the Quetzal" by the Guatemalan Government in recognition of his spice-producing firm's attaining world leadership in cardamon production and trade. In the years to come he will surely also receive the "Order of Appreciation" written or spoken by ever so many readers who will come from among the botanists and the botanically interested, those historically and geographically interested, those culinarily interested, and those professionally and pharmaceutically interested.

Arranged in alphabetical order under their English names the following are well treated: allspice or pimento, anise seed, basil, bay or laurel leaves, capsicum peppers (paprika, cayenne, chili), caraway seed, cardamon, celery seed, chervil, true cinnamon and cassia, cloves, coriander seed, cumin seed, dill, fennel seed, fenugreek, ginger, horseradish, marjoram and oregano, mint leaves, mustard seed, nutmeg and mace, onions (garlic & chives), parsley, pepper, poppy seed, rosemary, saffron, sage, savory, sesame seed, tarragon, thyme, tumeric and vanilla.

For each typically there is given the scientific name and classification, a colored plate of the plant specimen, a black-and-white photograph of it growing, a short history of the plant's uses, growing directions, spice production and recipes.

As source of Mexican "oregano" two species of Lippia are listed, but they actually represent only one plant since L. berlandieri is nothing more than a synonym of L. graveolens taxonomically.

Much fascinatingly valuable history and early maps are given

in the introduction. Over 400 illustrations add much to the content and appeal of the book including the cover linings depicting in color 40 spices in commercial form. There is an appendix with commercial statistics, a glossary and a comprehensive bibliography. There is an index for recipes and a general one.

"INTRODUCTION TO PLANT ECOLOGY", 2nd edition, by Maurice Ashby, vii & 287 pp., illus., Macmillan Ltd., London, Melbourne, Toronto and St. Martin's Press, New York City, N. Y. 10010. 1969. \$6.50.

This efficiently revised and modernized text, like the first edition of 1961, is directed to the sixth form level of the English school system and is useful in the United States as supplementary reading for undergraduate courses in ecology, botany, and general biology and as enrichment for advanced high school students and general readers.

Concepts are very clearly, simply, interestingly, and accurately developed and well documented with examples which are quite well known to most Englishmen -- young and old -- except for the really deprived who exist within very narrow ranges of urban slums. The more mobile, affluent and exposed-to-education Americans will miss out on many of these references partly because scientific names are not always given, but more so because so few recognize the flora and fauna of their own countryside, let alone that of another which they may even have visited.

The print, paper and illustrations are clear. A comma is misplaced in reference to the word "forest" on p. 249. "Nutrient" is misspelled on p. 228 and also "independent" on p. 233.

Part I deals with the tolerance of plants to their environment in terms of soils and chemical-physical root reactions; of light, temperature and water in shoot reactions; and of such biotic factors as man, other animals and plants through clearing, grazing, pollution, parasitism, etc.

Part II deals with aggression among plants in terms of responses to shade cast, to dispersal of pollen, fruits and seeds, as well as the mutual adaptations between them and their transporters.

Part III deals with the nature of plant communities, outlines the methods of studying vegetation and adds to the earlier edition an excellent and modern chapter on production ecology. It discusses characteristics of and variations in ecosystems, trophic levels, homeostasis, species structure and diversity, primary production and biomass, and ecosystem dynamics with the perpetual recycling of matter driven by recycling and dissipating energy. This chapter makes the book.

"ENVIRONMENTAL CONSERVATION", 2nd edition, by Raymond F. Dasmann, xiii & 375 pp., illus., John Wiley & Sons, Inc., London, Sydney, Toronto & New York, N. Y. 10016. 1968. \$8.95.

What an overwhelming change has occurred during the past decade in this field the following excerpts indicate: "This textbook.....expresses the opinion that in any planning for the future of man on this earth, we must also plan for the wild land and wild creatures which have been a part of his heritage" from the first edition of 1959. "Today we know that the world we live in is one biosphere and, unless we take a global view of environmental problems, our chances for survival are slim" from the richly revised current edition.

It is still an excellent wildlife management text that also discusses problems of urbanization, its pollution and world population explosion. It is well illustrated with black and white photos, attractive animal sketches by the author's wife and particularly helpful diagrams. It develops effectively the usual topics in such a text -- world's major biotic regions, agriculture, forestry, livestock, fisheries, wildlife, natural environment, and the public demand for recreation. It emphasizes throughout that a knowledge of ecology is basic to effective conservation programs. When discussing food pyramids the author does not mention energy use. Highlights include the Dust Bowl story, fish farming on farm ponds and in estuaries, the value of each species, and the suggestion that we encourage the blue whale that can make maximum use of the zooplankton rather than use its phytoplankton food for ourselves directly.

"RESOURCES AND MAN" -- a Study and Recommendations by the Committee on Resources and Man, National Academy of Sciences--National Research Council, edited by Preston Cloud, Chairman. xi & 259 pp., illus., W. H. Freeman & Co., San Francisco, California 94104. 1969. \$5.95 clothbound, \$2.95 paperbound.

This official report enumerates 26 specific world-wide, ecologically oriented recommendations that deserve wide publicity:

1. Assessing of world's actual and potential agricultural and forest lands, their best-use classification and increasing technical help of farmers;
2. Geochemical census of crustal rocks including those beneath the seas;
3. Reevaluating the Helium Conservation Program;
4. Monitoring radioactive waste disposal;
5. Goal of zero rate of population increase by end of century;
6. Renewal, enlargement and/or substitution of mineral resources;
7. Promoting pervasive interaction among environmental, behavioral, physical sciences and technology;
8. Formulating natural resource policies;

9. Increasing to maximum the efficiency and capacity of agricultural productivity;
10. Regulating fisheries that are overexploited or endangered;
11. Expanding "fisheries" of underexploited stock of all edible aquatic organisms;
12. Improving and extending aquatic "farming" operations;
13. Encouraging re-use and better use of recyclable materials and requiring it for minerals in short supply;
14. Reducing lag between the recognition of probable mineral resource shortages and investigations to alleviate them;
15. Accelerated and intensified geological exploring of continental shelves for minerals;
16. Prompt resolving of legal and/or international problems involving marine, mineral and underwater exploration;
17. Accelerate developing high-neutron-economy reactors including safe and efficient breeder reactor(s);
18. Conserving fossil fuels for uses which cannot be met by other sources;
19. Research into the complex of non-material (cultural) factors that affect man's use of and demand for resources;
20. Research into the thickly populated tropical lands and their insufficient crop yield;
21. Research into productivity of fresh and marine waters;
22. Research into methods of harvesting currently unused but edible aquatic organisms, as krill;
23. Research into processing, marketing, and consumer-acceptance of products, as fish-protein concentrates;
24. Research into geology, discovery and development of ore deposits;
25. Research into geology of the sea floor adjacent to the continents and beyond;
26. Establishing in the United States government a high-level group of broadly qualified resource specialists and ecologists to maintain surveillance of these resources, alert authorities to problems, and recommend early optimum courses of action to avoid or handle crises.

The bulk of the book is then composed of eight papers by outstanding scientists that deal with many phases of these recommendations under the following titles:— "The Human Ecosystem", "Interactions between Man and his Resources", "United States and World Populations", "Food from the Land", "Food from the Sea", "Mineral Resources from the Land", "Mineral Resources from the Sea", and "Energy Resources". Wildlife seems slighted. The sooner the text's words are catalyzed into intelligent action, the better for all of us!

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1

NEW TAXA AND NOTES ON THE SCROPHULARIACEAE OF PERU

Gabriel Edwin

Roosevelt University

The new taxa now presented complete the listing of novelties found while preparing the family for the Flora of Peru. The new species are in the genera Basistemon, Bartsia, Castilleja, and Calceolaria.

Basistemon Turcz., provisionally placed in the Scrophulariaceae, now with six known species, enters Peru only locally in the east at elevations up to 1,000 m. Castilleja has 9 of its 200 species in the Andes of Peru. Bartsia with 32 of its 60-70 species in Peru, is the second commonest genus of the family present. Calceolaria has 120 species represented, the predominant genus of the "Figworts" in these mountains and perhaps the most prevalent in species number of all the flowering plants in the northern Andes. This genus with about 550-600 species is badly in need of monographic attention. There are more taxa of "Slipper-flowers" in Peru than in the remaining 31 genera of the Scrophulariaceae combined.

The treatment of Calceolaria for the Flora is necessarily limited. Only the most urgent comparisons with extra-Peruvian taxa were made and also no proof of a supposed evolutionary arrangement was attempted. A reasonably searching study indicated that the classical approach of Bentham¹ and Kranzlin² had to be abandoned. In its place will be found a key that is, I hope, far simpler. Most of the major separations are those, it is felt, that offer the most suitable morphological bases for a future phylogenetic study.

Before the descriptions of new taxa, mention must be made of a new combination.

LINDERNIA THOUARSII (C. & S.) Edwin, comb. nov. Nortenia thouarsii C. & S., Linnaea 3: 18. 1828. Torenia parviflora Ham. in Wall., Cat. 3958. 1828. T. nortenia Steud., Nomen. ed 2. 2: 692. 1841. T. thouarsii (C. & S.) Kuntze, Rev. Gen. 2: 468. 1891, and Wettst. in Engler and Prantl, Pflanzenf. 4(3b): 79. 1895.

Lindernia All. differs from Torenia L. in corolla tube and lip structure and in calyx tube and lobation sufficiently to maintain the generic separation. The Peruvian material concerned has the narrow corolla tube with short entire lobes as well as the equal, wingless, partly free calyx lobes characteristic of Lindernia. Therefore, all of this material has been referred to

the last mentioned genus. That all new world specimens thus far seen, except those from gardens, pertain to Lindernia, strongly indicates that Torenia is wholly old world. However, species of Torenia are widely cultivated throughout much of North, Central, and South America, and it is not beyond the realm of possibility that one or more taxa may escape and naturalize.

BARTSIA ANOMALA Edwin, sp. nov.

Herba perennis; calycis lobi lanciolongi vel lanceo-triangulari acuti quam tubus breviores; corollae tubus quam lobi longior exsertus galea quam labium brevior; filamenta glabra vel parce glandulosa; capsula brevior quam calyx vel eum equitans ellipsoidiovoidea apicem apiculatibus.

Perennial herb, usually pubescent, occasionally merely puberulent on stems branches and foliage, erect, sometimes branching from the base. Leaves linear to lanceolate, crenate, slightly bullate, obtuse, narrowed to base, sessile; inflorescences spikes, usually lax and basally interrupted; pedicels 1.0-2.5 mm. long; bracts usually as the leaves, except margins distantly crenulate to almost entire, especially near the apices of the branches; flowers 13-22(-26) mm. long; corolla yellow or lower lip occasionally red to purple; calyx 8-11 mm. long, tubular, the acute, narrowly lance-oblong or lance-triangular lobes shorter than the tube; corolla tube longer than the lips, over one-half exserted, galea shorter than the lower lip whose lobes are oblong, rounded; filaments glabrous or with a few, minute, sessile, scattered glands, anthers puberulent; ovary densely beset with long, stiff, golden hair; capsule usually shorter than the calyx, occasionally about equal to the calyx, ellipsoid-ovoid, obtuse, apiculate, pubescent on the upper half, as the ovary.

Cuzco: Cerro de Colquepata, rocky slope on trail from Paucartambo to Vilcanota, alt 3400-3700 m., Pennell 13176 (BM, type; PH).

Ancash: Cordillera Blanca, 4000 m. alt. Kinsl P2298. --
Cajamarca: S.W. of Paso de Gavilan, S. of Cajamarca, alt 11,000 ft., Gourlay 96; Prov. Anta, alt. 3200 m., Herrera 3629. --
Huancavelica: Prov. Tayacaja, Hills N. of Pampas, alt 3200 m., Stork & Horton 10247.

This species differs from all other Bartsias by the combination of the following characteristics: galea shorter than the lip and lanceolate-oblong or lance-triangular, calyx lobes that are acute and clearly shorter than the calyx tube as well as relatively long, much exserted corollas.

The Taxon appears sporadically over much of Andean Peru.

BARTSIA AUREA Edwin, sp. nov.

Caulis juniores et rami lanati; folia oblongilinearia dense pubescentia remote crenata; flores aurea; galea glabra vel sparsissime puberula quam labium brevior; antherae parce vel dense lanatae.

Perennial (?) herb, up to 30 cm. tall, stems and branches lanate, oldest stems excepted, branching from the base, main branches, oblong-linear, up to 4 mm. long, the bracteate blades narrowly lance-ovate or linear, 5-7 mm. long, margins remotely crenate, apex obtuse, base occasionally a little narrowed; spikes apical, up to 4.5 cm. long, lax or subdense; bracts almost as long as the calyx, with a few, distant pairs of marginal teeth; pedicels lacking or up to 1.5 mm. long; calyx cylindric, 7-8 mm. long, densely pubescent, eglandular or almost so, tube usually a little longer than the narrowly lance-ovate, acute lobes; corolla yellow, 9-10 mm. long, tube a little longer than the lips, galea glabrous to puberulent, shorter than the lip (about one-half as long), lobes of the lip spreading, unequal, elliptically ovate, the median much longer and a little narrower than the lateral; filaments inserted near the base of the corolla tube, apically sparsely glandular with sessile glands, anthers sparsely to less often densely long-pubescent, basally acuminate; style puberulent on upper half, stigma-lobes united, punctiform, ovary densely beset with long, stiff, golden hair; fruit unknown.

Cuzco: Paucartambo, open, rocky slopes SSW. of Paucartambo, alt. 3200-3400 m., Pennell 14171 (GH: NY; PH). The only collection.

Stems slender and with a grey cast when dry. The combination of the galea much shorter than the lip and also glabrous or sparsely puberulent, yellow corolla and unequal lobing of the lower lip, as well as the small size of the corolla separates this taxon from all other *Bartsias*.

BARTSIA CURTIFLORA Edwin, sp. nov.

Herba parva recta vel ascendens ad 35 cm. dense pubescentia. Folia linearia vel anguste lancisubovatae, subintegra vel crenata plana vel vix revoluta; bracteae lineares et paucidentatae vel lanceisubovatae et plus minusve crenulatae; calycis lobi lanceolati vel anguste oblongi vel triangulari breviores quam tubus vel eum aequans; corollae tubus quam labium longior plus quam medium inclusum usque ad vix in toto inclusum galea quam labium brevior; antherae glabrae vel dense longi pubescentiae.

Erect or ascending, dwarf to 35 cm. tall, usually perennial,

rarely annual herb, usually branching from the base, densely pubescent, the inflorescence often glandular-pubescent as stems, calyx and corolla. Leaves linear to narrowly lancesubovate, only rarely exceeding 1.2 cm. long, usually less than 1.0 cm. long and 1-3(-4) mm. wide, subentire to crenulate, plane or little revolute, obtuse, narrowed or not to the sessile, clasping base; inflorescences long or short, usually dense, occasionally lax, often interrupted below, spikes or spikelike; pedicels up to 2 mm. long; bracts linear and few-toothed to lanceovate and more or less closely crenulate; calyx tubular-funnelform, 7-8 mm. long, lobes lanceolate or narrowly lanceoblong or -triangular, a little shorter to about equaling the length of the tube, acute; corolla usually yellow, 9-12 mm. long, tube from more than one-half to almost entirely included, longer than the lip, galea a little shorter than the lip; filaments sparsely glandular on upper one-half with sessile glands, anthers glabrous to more or less densely long-pubescent, basally acuminate; stigma lobes united, style puberulent over its entire length, ovary densely, stiff, golden pubescent; capsule longer than the calyx, oblong to ellipsoid-ovoid, obtuse with a sharp apiculum, the style or deciduous.

Cuzco: Ollantaitambo, open rocky slope, alt. 3000-3100 m., Pennell 13643 (BM; CH; NY; PH).

Arequipa: Pichu Pichu, alt. 13,500 ft., Stafford 810. -- Cuzco: Prov. Anta, alt. 3200 m., Herrera 3625; 3626; 3627b; alt. 3450 m., Vargas 296. -- Lima: Río Blanco, alt. 3000-3500 m., Killip and Smith 21633. -- Punco: Araranca, alt. 4100-4300 m., Pennell 13433.

This species differs from all other *Bartsias* by the combination of the following characters: Galea shorter than the lip, bracts linear to narrowly lance-subovate as are the leaves, corolla tube largely included in the calyx, the anthers sometimes glabrous and the narrow acute calyx teeth that are as long as or almost as long as the calyx tube.

BARTSIA DURIPILIS Edwin, sp. nov.

Suffrutosa hispida, ramosa, caules 4-angulata; folia amplexicaulis usque ad 4 cm. longis et 1.5 latis, flores 10-12 mm. longis, axillaris, pedicellati, bracteae quam flores longiores, pedicellis usque ad 5 mm. longis; calycis libi lateovati; tubus corollae inclusus, galea duplo longior quam labium ei pro parte inclusa.

Subshrub, erect and branched, wood and foliage hispid, the pubescence thickened at base, stem 4-angled and striate-sulcate. Leaves amplexicaul and cordate-subhastate, widest at the base, mostly shorter than the internodes, oblong, the largest about 4.0 cm. long and 1.5 cm. wide, frequently 3.0 cm. long

and 1.0 cm. wide, very coarsely crenate, obtuse; flowers axillary, pedicellate, in upper leaf-axils; bracts longer than the flowers, subovate; pedicels up to 5 mm. long, densely pubescent; calyx obliquely campanulate, 8-9 mm. long, tube much longer than the broadly ovate, obtuse, 1-veined lobes, pubescent; corolla up to 12 mm. long, dark rose colored with the lower lip greenish bordered, tube longer than the lips, included in the calyx, galea dorsally tomentulose, obtuse, at least 2 times longer than the lower lip, barely emarginate, lip at least partly included in the calyx, lobes ovate, subequal; filaments with sessile glands on upper part, anthers pubescent with long matted hair, acuminate at base; style puberulent, stigma lobes united, ovary densely beset with long, golden, stiff hair; fruit unknown.

Ayacucho: Prov. Huanta: Putis, Choimacota Valley, in evergreen shrub woods alt. 3200-3300 m. Weberbauer 7533, (f).

A clearly distinct taxon differing from all other *Bartsias*, by the following combination of characters: stiffly hispid pubescence, large leaves, included corolla tube and partly included lower lip, oblique calyx with short, broad, obtuse lobes, longish pedicels, flowers borne in axils of leaves, not forming a definite spike or raceme and of small size. The lack of a definite inflorescence is rare in Bartsia.

BARTSIA GLABRA Edwin, sp. nov.

Herba, caules simplex, parce apperssa vel subapperssa puberulentia vel pubescentia; folia glabra; capsula glabra vel parce albidopubescentia; flores 8-12 mm. longi, corolla alba, galea quam labium vix longior eglanduasa.

Herb, stems simple, sparsely puberulent, rarely pubescent with the short-pubescence subappressed or appressed, foliage and fruit glabrous or the capsules occasionally with scant, white pubescence apically. Leaves linear or aciculiform to narrowly oblong-linear, up to 11 mm. long and 1-2 mm. wide, often 6-8 mm. long, margin bullata-crenate and revolute, obtuse and hamate at apex, slightly broadened and clasping at the sessile base, the costa elevated beneath; spikes dense above, interrupted below; bracts shorter than the flowers, similar to the stem leaves, except margins crenate on upper part only and a little wider in relation to the length; pedicels 1-2 mm. long; flowers up to 12 mm. long, usually 8-10 mm.; calyx 4-6 mm. long, tube longer than the lobes, pubescent on the veins, lobes narrowly ovate, acute, pubescent on the veins, margins ciliates; corolla white (in life), tube exserted, longer than the lips; galea pubescent, a little longer than the lower lip; filaments apically sparsely glandular and sparsely, very short-puberulent just below the

summit, anthers glabrous to sparsely long-pubescent, acuminate; style puberulent above, stigma lobes united, ovary glabrous or apically with scant, stiff, white pubescence; capsule ellipsoid-ovoid, shorter than the calyx.

Amazons: cerro de Fraijaco (Huaui-Huni), n.e. of Tambo de Ventilla, dry jalos, alt. 3500 m. Pennell 15878 (PH).

This species differs from all other *Bartsias* by the following combination of characters: corolla whitish, foliage, fruit and ovary glabrous or almost so, eglandular galea and appressed puberulence on most of the stems.

BARTSIA PEDICELLATA Edwin, sp. nov.

Herba annua, caulis pubescentium-puberulum multicellularum, applanatum; folia glabra vel parce multicellulosa pubescentia venibus majoribus et marginibus; flores in laxis racemis aggregati vel axillari; pedicelli erecti stricti 7 (-8) mm. longi; calycis lobi crenati, ovarium glabrum; capsula glabra oblonga subduplo longior quam calyx.

Erect annual herb simple or with a few, short, rosulate branches, stems pubescent-puberulent with flattened, somewhat curly, multicellular hair. Leaves glabrous or sparsely pubescent on the margins and main veins with multicellular hair, linear or narrowly oblanceolate, up to about 1.0 cm. long and 0.2 cm. wide, crenate-revolute, apex obtuse, hammate, base sessile, subclasping; floriferous over most of the length of the stems in lax racemes, or flowers axillary; bracts wider than the cauline leaves; pedicels 7 (-8) mm. long, erect, almost parallel to the stem; flowers 8-11 mm. long; calyx oblique, tube longer than the crenate, obtusely rounded lobes; corolla purple, tube longer than the lips, galea tomentose with multicellular hair, about twice as long as the lip, lobes of the lip elliptic-oblong; filaments sparsely glandular above with sessile glands, anthers tomentose, acuminate at base; style glabrous, stigmas united, ovary glabrous; capsule glabrous, oblong, almost twice the length of the calyx, mucronulate at the obtuse apex.

Cuzco: Paucartambo to Trés Cruces, Cerro de Cusilluyoc, moist gravelly banks and swales, alt. 3500-3800 m., corolla "dull magenta purple". Annual herb, Pennell 13815 (F, type; BM; K; PH).

This taxon differs from all other *Bartsia* by the combination of multicellular, flattened pubescence on the stems and branches, erect, strict, 7-8 mm. long pedicels, crenate calyx lobes and glabrous capsule twice the length of the calyx.

BARTSIA SIMULANS Edwin sp. nov.

Frutex parvus ad basim ramosus, pubescens mixto pillis et glandulosis et eglandulosis aliquando duris; folia et bracteae lobis margine amplificati ad apice, calycis lobi longiores quam tubus oblongi vel laceoblongi; corolla inclusa vel fere exserta; antherae glabrae and basim mucronulatas.

Perennial shrublet up to about 20 cm tall, branching from the base. Stems terete, drying light to dark brown, the soft, glandular-pubescence mixed with soft and loose scattered, stiff, eglandular hairs; leaf-blades thickened, sessile, pubescent above, beneath and on the margins as the stem, except more stiff hairs present, obovate or spatulate-obovate or oblong-obovate in outline, up to about 1.0 cm. long and half as wide, margins with 3-5 pairs of rounded, close or distant lobes, these increasing in size base to apex, the apical lobe largest, narrowed to base, venation obscure above, apparent beneath; flowers in short, apical, dense, spikes; bracts similar to the leaves, except a little smaller and the 2-3 pairs of lobes usually more or less distant, shorter than the flowers; calyx glandular, 9-11 mm. long, tube 4-5 mm. long, little shorter than the 5-6 mm. long, lance-oblong or oblong, subacute lobes; corolla 10-13 mm. long, yellow and red, almost wholly included in the calyx to little exserted, the corolla tube entirely included, narrow, longer than the lips, galea 3.0-4.5 mm. long, dorsally densely glandular, apically notched, little shorter than the lip, lobes of the lip very broadly ovate to suborbicular, the median little larger than the lateral; stamens didynamous, the pairs very unequal in length, anthers glabrous, basally mucronulate, filaments sparsely puberulent (under 20x); style exceeding the stamens, stigma exserted, punctiform, ovary densely, golden pubescent, the hairs stiffish; capsule elliptical or elliptically obovoid, little shorter than the calyx, pubescent at least apically with long, stiffish, golden hairs and apiculate, style tardily deciduous or persistent, placenta thin; seed numerous, ovoid, narrowed to both ends, testa striate-striatulate, closely adherent.

Puno: San Antonio de Esquilache in clefts in face of rock at alt. 15,500 feet, 5/16/37. Stafford 743, (BM).

Most closely resembling Bartsia diffusa Benth. which has ovate bracts whose lobes decrease in size base to apex, exserted corollas, wider calyx lobes that are usually not longer than the calyx tube and different pubescence.

BARTSIA VIRIDIS Edwin, sp. nov.

Herba caulibus juvenalis pubescentiis pilis linearis

disposita, veteris saepi glabratis; corolla viridas tubo et labio incluso in calycem galea duplo longior quam labium eglandulosa pubescetia capsula ovoidea obtusa quam calyx breviora.

Annual, erect herb, old stems glabrate, younger with definite lines of soft pubescence, all stems 4-angled, sulcate, drying very dark red to black. Leaves linear or aciculiform, usually minute to 6 mm. long, occasionally reaching 2.0 cm., bullata-crenate and revolute, apex obtuse, hamate, often a little widened to the clasping base, sessile, glabrous or sparsely pubescent, main vein elevated beneath, other venation not visible; flowers mostly aggregated into short, lax, interrupted spikes; bracts crenate, at least the upper ellipsoid-ovate, about as long as or barely exceeding the calyces; flowers sessile or subsessile on pedicels reaching 2 mm. long, usually not exceeding 1.5 mm., and very small for the genus, 8-10 mm. long, occasionally up to 11 mm.; calyx narrow, usually glandular-puberulent, 4.0-5.5 mm. long, tube longer than the lance-triangular, acute lobes; corolla green, tube longer than the lips, galea up to 2 times as long as the lower lip, usually about 1.5 times longer, eglandular, pubescent, lobes of the lip unequal, the median longer than the lateral, all ovate, rounded; filaments sparsely dotted with small, sessile glands, anthers pubescent, mucronate at base; style puberulent above, stigma lobes united, ovary beset with long, stiff, golden hair; capsule ovoid to broadly ovoid, obtuse to rounded at apex, with long, stiff, golden hair apically, a little shorter than the calyx and enveloped by it.

Cuzco: Paso de Tres Cruces, Cerro de Cusilluyac, mossy banks and knolls on paramo, alt. 3700-3900 m. Pennell 13826 (F, type; BM; CH; K; NY; PH).

The combination of very small, green flowers with included corolla tube and partly included lower tip as well as the arrangement of the pubescence on the stems and branches separates this taxon from all other Bartsias.

According to the collector the corolla is "mignonette green".

BASISTEMON INTERMEDIUS Edwin, sp. nov.

Frutex inermis; caules minute puberule; folia sessilia vel subsessilia glabra ovate marginibus minute serrulatis basis obtusis; petioli puberuli ad basim gibbosos; flores axillares brevipedicellatae paucifasciculatae et pedicelli et calyces puberuli.

Unarmed shrub with glabrous leaves, otherwise mostly minutely puberulent. Leaves ovate, acuminate, 3.5-6.0 cm. long and 1.5-3.3 cm. wide, bases obtuse, margins minutely serrulate, puncticulate on both surfaces; petioles up to 0.8 mm. long or lacking, minutely puberulent, gibbose at base and at least partly surrounding the stem; flowers 2-3 fasciculate, in axils of unmodified leaves, pedicellate; pedicels 3-5 mm. long, puberulent, with a pair of minute, hard, puberulent bracteoles at the bases calyx with 5 ovate, puberulent lobes, 3.0-3.5 mm. long, apices long-acuminate, margins ciliolate, united about 1/3 their length into a campanulate tube; corolla weakly saccate at base, whites, 7-8 mm. long, bilabiate, lips subequal, the 2-anterior lobes little shorter than the 3 posterior, tube about 6 mm. long; stamens 4, didynamous, anterior pair about 2 mm. long, posterior 3 mm. long, anthers sub-ovoid, divergent, dehiscent by longitudinal slits, connective enlarged, **hardened** at maturity, filaments gibbose at base, inserted about 1 mm. above the base of the corolla tube; ovary narrowly ellipsoid-ovoid, much shorter than the style, stigma lobes united, punctiform; fruit unknown.

Haunuco: Ganso Azul, Agua Caliente on Río Pachitea, alt. 1000 ft. dense shade; Oct 17, 1942, C. Sandeman 3380 (K, type; OXF).

Near B. peruvianus Benth. & Hook. f. apud Hook f. & Jacks. but differing in the length of corolla lobes in relation to the tube, distribution and amount of vestiture and in size of the leaves. The taxon appears to stand between B. peruvianus and B. Moldenke.

CALCEOLARIA AEQUILATERALIS Edwin, sp. nov.

Herba perennis saepe volubilis caules molliter 4-angulata. Petioli alatis, alae latae connat, ad caulem latissima costa infra elevata planata; laminae superiores sessiles cetera (petiolata) latissima deltoidea vel ovatodeltoidea latiora quam longiora; dichasia paucifloribus flores usque ad 40 mm. longos; sepalis ovata acuta vel acuminata usque 23 cm. longa; corolla magna labium inferum saccatum fere apertura clausa; thecae antherarum plerumque inaequalis; stylus 8-10 mm. longus.

Perennial herb, often scrambling, stem soft, 4-angled, frequently pubescent or puberulent, especially below. Leaves bizarre, petioles broadly winged, connate, broadest at the stem, usually serrulate, at least on the lower half, occasionally irregularly dentate, usually a little shorter than the blade, midvein flattened, elevated beneath, uppermost blades sessile, broadly ovate, usually the smallest, remaining blades (petiolate) very broadly deltoid or triangular, less often ovate-triangular, frequently wider than long or as wide as long, very big for

the genus, 8-12 (-14) cm. long and 9-14 (-15) cm. wide, irregularly coarsely crenate-dentate, narrowing to apex, cordate or truncate at base, occasionally broadly ovate, puberulent; inflorescences usually few flowered, ca. 7-15, dichasiate; flowers up to ca. 40 mm. long; sepals up to 23 mm. long, broadly ovate, acute or acuminate, glabrous or puberulent on lower half; upper corolla lip ca. 8-15 mm. long, cucullate, lower lip to 30-35 mm. long, orifice almost closed, nectiferous flap much lighter colored, sac much inflated in life, glabrous, except for a tuft of hair inside at base; anthers large, cells usually ca. 2 times as long as wide, mostly unequal, occasionally sub-equal or equal, filaments short; style 8-10 mm. long; ovary pubescent; capsule broadly ovoid, narrowed to apex, densely pubescent, much smaller than and overtopped by the closely investing calyx.

Amazonas: Cerro Puma-urco southeast of Chachapoyas. Rocky bank near summit, alt. 3300-3400 m., Pennell 15905, (PH, type; F: NY); Rocky cliff, alt. 3300-3400 m., Pennell 15894. --Cuzco: Macchu Picchu, Urubamba Valley, ca. 5000 ft. alt., Balls 6812; 2000 m., Rauh-Hirsch P854; 809. -- Lima: Hualgayoc: Monte Seco, alt 1800 m., Soukup 3834. -- Pasco: Huariaca, wet place alt. ca. 9500 ft., Macbride 3124.

CALCEOLARIA ANNUA Edwin, sp. nov.

Herba annua ad 20 cm. alta, ramosa, pars superus pilis 2-cellulis et glandulosis, glandulae parvae, ad basim glabratae; folia petiolata, parva, laminae ovatae, irregulariter grosse dentatae vel interdum pinnatae, pinnae variabilis, contextus superus frequenter glabrus rare pubescentius inferus frequenter pulverulentus usque ad 3 cm. longa plerumque 1-2 cm. longa et 6-9 mm. lata basis mox decurrens in petiolam; petioli dense pubescentes descreti; inflorescentia plerumque cymosa 3-floribus, rare reductio ad 1- flore in axillis laminarum summis; antherae stipa brevissima, loculi et superi et inferi fertiles.

Annual, branched herb, upper part of the stems pilose with 2-celled, usually gland-tipped hairs, glands minute, becoming glabrous near the base, internodes almost always longer than the leaves. Leaves petiolate, very variable, especially as to margins, usually ovate in outline, mostly 1-2 cm. long and 6-9 mm. wide, rarely reaching 3 cm. long, margins from grossly dentate especially below to occasionally pinnate or almost so above, when pinnate, the pinnae variable in size and outline, tissue usually glabrous above, occasionally pubescent, most often pulverulent beneath, base of the blade only over very short decurrent on the densely pubescent, discrete petioles; inflorescences most often 3-flowered cymes, rarely reduced to 1 flower, borne in pairs from the axils of the uppermost leaves or occasionally from

the axils of the upper 2-3 pairs of leaves; peduncles up to 3.5 cm. long, pilose as the upper part of the stems; flower size variable; calyx tube pubescent, lobes externally subglabrous, veins parallel, internally glabrous, ovate or elliptical, acute, sometimes 2 different sizes on one flower, 6-8 mm. long and 2-5 mm. wide; corolla yellow, upper lip 2-4 mm. long, sparsely glandular, glands red, sessile, internally glabrous, nectary almost marginal on the inflated 12-15 mm. long sac, 2-parted, very reduced; filaments less than 1 mm. long, anther cell connective shorter than both of the fertile locules the larger of which is about 2 mm. long and the smaller about 1.3-1.4 mm. long; style glabrous, little curved, 1.9-2.4 mm. long; capsule about as long as to little longer than the calyx, glabrous, ovoid, the upper part abruptly narrowed into a short, lanceolate neck, style soon fugacious.

Lima: Moist rock ledges and granitic soil, S. of Surco, 2400-3500 m. alt. Pennell & Ferreyra 15245, (US, type: PG).

Distributed in Dept. of Lima and possibly one collection from Junin (Iltis, Iltis, Ugent & Ugent 226, WIS).

Lima: Rio Blanco, between San Mateo and Casapalca, alt. 3500-3550 m., Ferreyra 6974; Rio Blanco, alt. ca. 15,000 ft., Macbride 3038; alt. ca. 12,000 Macbride & Featherstone 683; Canta, alt. 2700-3200 m., Pennell 14333.

The combination of usually dentate leaves and relatively large corolla with copious sac and very reduced nectary distinguishes this taxon from C. delicatula Kränzl. to which it is morphologically closely allied.

CALCEOLARIA APERTA Edwin, sp. nov.

Folia angustiovate vel ovata vel oblongiovata brevipetiolata dense lanata usque ad dense tomentosa; labium superum corollae ca. calycen aequilongum inferum vix saccatum, apertum excepte ca. 1-3 mm. ad margines; stylus 7-8 mm. longus, stigma gibbosa latior quam stylus.

Shrub to about 1 m. tall, foliage densely lanate or tomentose, stem branched, drying red-brown, appressed-puberulent or -pilose when young, glabrate in age. Leaves narrowly ovate or ovate or oblong-ovate, those of the stem up to 4.2 cm. long and 2.0 cm. wide, usually a little smaller, those of the branches smaller, all leaves densely lanate when young, becoming tomentose with age, margins crenate-dentate or crenulate-denticulate, apices acute, bases broadly obtuse to (especially the larger) cordate, short-petiolate; petioles lanate; flowers in compound dichasia with long, basal peduncles (up to 5.5 cm.) and short

pedicels, ca. 0.5-2.0 cm. long, flower stalks puberulent to tomentose; calyx lobes ovate, ca. 6 mm. long and almost as wide at base, apex obtuse, tomentulose on both surfaces; corolla 13-17 mm. long, essentially glabrous, upper lip erect, up to 5 mm. long, almost as long as the sepals, hooded, lower lip saccate merely along the margin, about 1-3 mm., nectary thin, linear; filaments short, ca. 1 mm. long, thickest at base; anthers large for the corolla, each cell about 2 mm. long and almost as wide medianly, broadly ovoid, papillose-glandular, drying brown with buff colored lower margins; style thickened, 7-8 mm. long, stigma very thickened and gibbose much larger than the style, ovary short, broadly ovoid, densely beset with sessile glands; capsule unknown.

Lima: Prov. Canta: near Antaicocha, Cerro Colorado, east of Canta, rocky wall of canyon, alt. 3600-3800 m., Pennell 14642, (US, type; PH).

A very clearly marked taxon with no morphologically similar species in Peru. Known only from the type collection.

CALCEOLARIA ARBORESCENS Edwin, sp. nov.

Frutex subglaber ramosissimus erectus caulibus rigidibus et follis bicoloris, dimidiis subcoriaceis. Inflorescentia multiflora paniculata-dichasia plus minusve puberulenta-pubescentia et glandulosa; labium superum corollae breviorum quam sepala, labium inferum plus quam duplo longior superum saccata usque ad one-half - three-fifths ea longitudo, minute papilloso-glandulosa; stamina brevissima, thecae antherarum inaequales longitudo plus quam duplo latitudo.

Erect, much-branched, subglabrous shrub up to almost 3 m. tall with rigid stems and subcoriaceous, bicolorous, viscid leaves, pubescence restricted to the inflorescences and sometimes the younger wood. Leaves ovate to less often elliptical, variable in size from 1-6 cm. long and 0.5-2.5 mm. wide, usually ca. 3-5 cm. and 1-2 cm., entire to serrulate, narrowed to apex and base, often dimidiate, drying dark green above and pale yellow-green beneath, veins faintly visible above, prominent beneath, costa a little elevated, other venation reticulate, petiolate; petioles up to 1.4 cm. long, mostly 5-8 mm. long; inflorescences many-flowered, paniculate-dichasia, terminal on the branches; the flower stalks puberulent or pubescent, basal peduncles up to 4.5 cm. long, terminated by a pair of reduced leaves, decreasing to ultimate pedicels a few mm. long; calyces puberulent-pubescent, lobes unequal in width, ovate to elliptical, 6-8 mm. long and 3-5 mm. wide at base, margins minutely ciliolate, apices acute, internally usually glabrous; corolla yellow, 25-27 (-30) mm. long, both lips externally more or less densely beset with minute, stalked glands; upper lip hooded, up to about 4 mm. long, lower lip up to 25 mm. long, saccate up

to three-fifths its length, only little narrowed proximally, glabrous internally or a tift of white hairs at base; filaments very short, anther cells divaricate, slightly to very unequal in size, each pair of cells 5 mm. long, each cell most often at least twice as long as wide, anthers dehiscing thru the septum; style 3-4 long, a little curved at apex, stigma punctiform, ovary glandular as the corolla; capsule not known.

Amazonas: Cerro Calla Calla above Leimebamba (19 km.), alt. 3000 m., Hutchison & Wright 6916. --Ancash: Bolognesi, between Tallenga and Pachapaque, Ferreya 7479; Ancash: West slope of Cordillera Negra, below Paso de Collán, rocky slopes and banks, alt. 3690 m., Pennell 15476, (PH, type; PH; US); Moist bank above stream, south slope of Paso de Fortalésa, alt. 3550 m., Pennell 15398. --Punin: alt. 3500 m., Ochoa 721.

Morphologically closest to C. deflexa var. aurantiaca and also C. deflexa var. typica differing from both in having the lower lip of the corolla more than twice as long as the upper, in unequal anther cells and in the upper lip of the corolla shorter than the sepals as well as different vesture in the inflorescence. C. arborescens differs from the typical deflexa also in leaf shape. The superficial resemblance between arborescens and deflexa var. aurantiaca is striking but the taxa differ profoundly on a technical basis.

CALCEOLARIA BRACHYANTHA Edwin, sp. nov.

Frutex glandulosus ramosissimus laminis minutis ad parvis; labium inferum corollae saccatum three-fourths - four-fifths eus longitudinus; sepalis utrinque glanduloso-pubescentis; staminibus perbrevis filamentis subobsoletis antheris divaricatis inaequalis parvis; capsulis longiore quam calyce dense glandulosis.

Glandular, erect shrub, much branched with ascending branches. Leaves minute to very small, sometimes with abbreviated shoots in the axils, the leaves then appearing clustered, linear or occasionally lanceolate-linear or aciculi-form, mostly 1-3 mm. wide but infrequently up to 6-7 mm. and up to about 1.2 cm. long, mostly shorter, margin entire or with 2-3 pair of teeth near the apex, usually revolute, apically acute, either sessile or short-petiolate, when present the minute petiole thickened and the leaf-base short-sagittate, blades glandular-puberulent or -pubescent on both surfaces, especially on the costa beneath, main vein impressed above, elevated beneath, other venation obsolete, tissue dark green above, pale green beneath, coriaceous and usually thickened; inflorescences terminal on the branches, few- to about 15-flowered, regularly or irregularly branching dichasia; peduncles and pedicels glandular and erect, peduncles usually 2-3 times longer than the pedicels; flowers very variable in size; sepals lance-ovate to ovate on the

same flower, usually about 4 mm. long and 3 mm. wide at base or 5 mm. long and 2 mm. wide at base, (those of the smallest flowered collections about two-thirds the others), acute, glandular-puberulent on both surfaces; corolla yellow, 13-26 mm. long, externally glabrous or the upper lip puberulent; upper lip about one-half - two-thirds the length of the sepals, covering the stamens, lower lip oblong, saccate about three-fourths - four-fifths its length, internally glabrous; stamens with very short (subobsolete) filaments, anthers among the smallest in the genus, cells a little unequal or almost equal, divaricate, each pair ca. 2.5-3.0 mm. long and about one-third - one-half as wide; style thickened, ca. 2.0-2.5 mm. long, about the size of the densely glandular ovary; capsule glandular, exceeding the calyx, 5-7 (-8) mm. long, and 2-3 mm. wide at base, ovoid-conic, long acute, style persistent.

Distributed in the Andes from north central Peru, departments Ancash, Libertad and Cajamarca.

Cajamarca: Rocky limestone, alt. 2750-2850 m., ridge 11 km. S. of Cajamarca, Pennell & Anderson 15076 (PH).

Ancash: Shincush above Chiquián in Prov. Bolognesi, alt. 3980 m., Ferreyra 5820 --Cajamarca: Between Cajabamba and Huamachuco, Prov. Cajabamba, alt. 3000-3200 m., Ferreyra 3053; Cumbre above Cajamarca, alt. 3500 m., Olsson 2; Cajamarca - Culentin (prob - Celedin) Road, km. 15.5, Olsson s.m., Feb. 11, 1948; Rocky limestone, alt. 2750-2850 m., ridge 11 km. S. of Cajamarca, Pennell & Anderson 15077; Banos del Ynca, just outside Cajamarca, Soukup 4627 and 4630. --Libertad; Toyabamba, in Timber-line scrub, alt. 11,000 ft., Carricker s.n.; Otuzco, Ferreyra 3043; Above Huamacucho, alt. 3400 m., Pennell & Ferreyra 14872.

This species is close to Calceolaria linearis R. & P., C. cajabambae Kr. ludens Kr. and C. engleriana Kr., differing from these by various character combinations especially anther size, calyx lobe shape and vesture and leaf blade shape and size.

CALCEOLARIA COLCAMPARENSIS Edwin, sp. nov.

Herba simplex vel pauciramosa adpressa pubescentia; rami abbreviati axillari; margines laminarum serrata-serrulata, vena subta elevata incrassata; petioli descreti, incrassati; sepala juvenalia ut lamina pubescentia, veteres sparse pubescentia et venulosa; corolla 13-17 mm. longa, glabra, fere medio saccata, orificium obliquum.

Erect, appressed-pubescent herb, stems simple or few-branched, branches, when present, frequently abbreviated in leaf-axils, nodes mostly much longer than the leaves, pubescence

soft, white or light-gray, densest on younger growth. Leaves short-petiolate, ovate or less often narrowly ovate, all but the largest at least twice as long as wide, (1.5-) 2.0-4.8 cm. long and 0.6-2.0 (3.0) cm. wide, margins serrate-serrulate, apex broadly acute, base cuneate, densely appressed-short-pubescent and red-punctate above, appressed-pubescent on the elevated, almost white, thickened veins and densely red-punctate beneath; petioles 2-10 mm. long, sparsely to densely pubescent, thickened, discrete; inflorescences terminal or in upper axils, dichasiate-corymbose, few- (ca. 3-5-) to many-flowered (ca. 15-20); basal peduncles up to 3 cm. long, flower-stalks decreasing to ultimate pedicels a few mm. long, all stalks densely appressed-pubescent; calyx lobes when young with pubescence and venation as the lower surface of the leaves, veins with age less apparent and vestiture less dense, mostly ovate, acute, 7-10 mm. long, internally glabrous; corolla yellow, wholly glabrous, 13-17 mm. long; upper lip 2-4 mm. long; lower lip distally almost round, saccate less than one-half way, orifice oblique; stamens small, filaments short, anther cells equal, divaricate, a little less to a little more than twice as long as wide, each cell ca. 1.2-1.4 mm. long, red-brown when dry; style 1.5-2.0 mm. long, glabrous, ovary resinous, dark red-gland-dotted; capsule broadly ovoid, abruptly long-acute, 5-6 mm. long and wide, red-gland-dotted.

Amazonas: Roadsides on dry loam, alt. 2300-2800 m., Colcamar, Pennell 15604, (US, type; PH; US).

This species differs from all other *Calceolarias* by the combination of the following characters: flattened, elevated, white venation on the leaf blades beneath, densely red-gland-dotted fruit, calyx and blade, sepals often about half as long as the lower lip of the corolla and adpressed pubescence on the stems and branches.

CALCEOLARIA COLLANESIS Edwin, sp. nov.

Frutex ramosissimus, lignis juvenalis dense albis puberulentis-pubescentiis, venustis glabrescentiis, internodiis distantiis, ramis et ramulis tortuosis in sicco brunneus and atrobrunneus vel nigrus; petiolus basim induratus, lignosus, imcrassatus; calycis lobi extus glabri vel puberulenti ellipici vel ovati; corolla usque ad 12 mm. long, vix saccata.

Erect, much-branched shrub, the wood when young densely white-puberulent-pubescent, becoming glabrous with age, branches twisted, drying brown to dark brown or black, internodes much longer than the leaves, sometimes 5-7 times as long. Leaves petiolate, ovate to very broadly ovate, 0.6-1.5 cm. long and 4-10 mm. wide, margins narrowly revolute, thickened, with 3-7 pairs of

obtuse lobes or teeth, pubescent-puberulent on both surfaces, hairs curly beneath, apically acutish, basally broadly obtuse to subtruncate; petioles short, up to 5 mm. long, pubescent-puberulent, thickened, swollen and woody at base, the petioles of the main stems and branches with abbreviated branchlets in the axils; inflorescences simple or branched dichasia, borne in upper leaf-axils on stems and branches, occasionally the dichasium suppressed and axils 1-flowered; flower stalks short, pubescent-puberulent; bractlets when present, minute; calyx lobes elliptically ovate or elliptical, 5-6 mm. long and 1.5-2.5 mm. wide, pubescent on both surfaces; corolla 11-12 mm. long, drying dark brown (orange-red in life?), lower lip ca. 2 mm. long, upper lip saccate distally only 1-2 mm., sac undulate, nectary only partly reflexed-hidden, almost as long as the sac, entire lip glabrous or sparsely papillose-puberulent; filaments 1.0-1.5 mm. long, anther cells equal, divaricate, little longer than wide; style ca. 1.0-1.5 mm. long, ovary red-shining-glandular; capsule exceeding the calyx, 7-8 mm. longer, narrowly ovate to ovate, upper half narrowly elongate, beaklike, red-shinning-glandular, glands short-stalked.

Known only from the holotype.

Ancash: Western slope of Cordillera Negra, below Paso de Collan, bank along stream, alt. 3500 m., Pennell 15470, (PH).

Although the specimen is not well prepared it is sufficient for description.

This taxon is quite distinct from all other taxa due to the combination of open corolla with undulate sac and prominent nectary as well as the swollen petioles with abbreviated axillary shoots and finally the long internodes.

CALCEOLARIA CORDIFORMIS Edwin, sp. nov.

Herba perennis scandentia vel fruticula; caules ramosi juvenali dense tomentoso lanati veteres fere flabri; lamina sessilia vel subsessilia lateovata-cordiforma plerumque usque ad 1.5 cm. longam et 9 mm. latam subta dense tomentosolanata pubescentia contextu obrata; calycis lobi extus lanati intus glabri vel sparsissime puberulenti; corolla glabrata 7-9 mm. longa saccata fere medio; stamina parva 1.8-2.2 mm. longa duplo longiora quam latiora; stylus brevis, capsula glandulosa breviora quam et in calycem inclusa.

Climbing perennial herb or subshrub, stems branched, when young densely tomentose-lanate, becoming almost glabrous with age, nodes longer or shorter than the leaf blades. Leaves opposite or verticillate, broadly ovate-cordiform, mostly up to 1.5 cm. long, rarely up to 2.5 cm. and up to 9 mm. wide,

occasionally up to 2 cm. wide; tomentose above, very densely tomentose-lanate beneath, the pubescence completely obscuring the tissue, margins revolute, dentate, teeth large, round, apex sub-acute or acute, bases cordate, occasionally truncate or broadly obtuse, venation impressed above, sessile or subsessile; petioles when present up to 4 mm. long, very densely lanate; inflorescences dichasiate, dense, terminal or in upper leaf-axils, flower stalks not exceeding 2 cm. long, often lanate, internally glabrous or sparsely puberulent at the apex, especially when young, ovate, ca. 5 mm. long and 4 mm. wide near the base, entire, acute; corolla yellow, wholly glabrous, 7-9 mm. long, lower lip 1-2 mm. long, upper lip saccate less than one-half its length, ca. 3-4 mm. wide; anther cells equal, each pair divaricate, ca. 1.5-2.2 mm. long, about twice as long as wide, filaments ca. 2 mm. long; ovary glandular, style short, ca. 1-2 mm. long; capsule glandular, ovoid-conic, acute, shorter than and loosely invested by the calyx lobes.

This taxon will be keyed as leaves more or less than 1 cm. wide, since the largest leaves indicate the strong possibility that future collections may well have all or most leaf blades wider than 1 cm.

Cajamarca: along streamlet, above Llama, alt. 2450 m., Pennell 15924, (PH); Prov. Chota, Huambos, alt. ca. 2000 m., Soukup 4549. --Piura: Road from Huancabamba to the 3 acequias, alt. ca. 2500 m., Scolnik 1422.

This taxon is closest to C. hедера, C. aperta, and C. velutinoides Edwin, but quite readily separable from these taxa.

Calceolaria corymbosa R. & P. var. perennis Edwin, var. nov.

Differt a typica caulibus foliosis erectis elongatis internodiis gibbosis et inflorescentiis in axillis foliis superis dispositis.

Differs from the typical in having leafy, erect and elongate stems and the inflorescences in the axils of the upper leaves.

Libertad: 32 km. above Samne on road to Shorey, Prov. Otuzco, sprawling shrub on roadbanks, alt. 3110 m., Hutchison and Wright 6130 (UC, type; F; US; USM; others).

Although differing appreciably in habit, the flowers and leaves are close to the typical variety.

CALCEOLARIA CROCEOPUNCTATA Edwin, sp. nov.

Frutex ramosus, erectus; folia subta in venis dense tomentosolanosa et textura denissima croceopunctata; inflorescentia dichasiata-paniculata; corolla lutea, labium inferum saccatum minus quam medium; antherae sagittatae, in septo acuminato; stylus 6 mm. longus.

Shrub, erect, branched, internodes distant, up to ca. 13 cm. long, about 4-6 times longer than the leaves near the base to only 2-3 times longer than the leaves below the inflorescences, current wood sparsely pubescent with recumbent white hairs, soon glabrate, bark drying smooth. Leaf blades (very) short-petiolate, ovate, mostly 2-3 cm. long and 1.0-1.3 cm. wide, crenate, acute at apex, obtuse to subtruncate at base, rugulose, sparsely puberulent above, densely tomentose-lanose on the veins and very densely punctate with sessile, shining orange punctations beneath; petiole densely lanate, up to 3 mm. long, reduced leaves often present in the axils; inflorescences paired, many-flowered, dichasiata-panicles, in the upper leaf axils of stems and branches; peduncles 2-3 cm. long, pedicles 1-2 cm. long, all flower-stalks densely lanate; flowers 13-17 mm. long; calyx lobes dimorphic on each flower, lance-elliptic or ovate, 7 mm. long and 3 mm. wide over 6-7 mm. long and 5 mm. wide, pubescent-puberulent on both surfaces; corolla yellow, minutely papillose, tuft of white hair within at the base, upper lip 4-6 mm. long, lower lip 9-12 mm. long, saccate less than one-half its length, sac only little wider than proximal part of lip; filaments 1.0-1.5 mm. long, anther cells equal, sagittate, each pair 3.0-3.4 mm. long, each cell ca. 1.2 mm. wide, an acumin developed at the apex of the septum; style ca. 6 mm. long, very long for the flower, exceeding the upper lip of the corolla; ovary glandular-pubescent, glands stalked, red; capsule broadly deltoid-ovoid, acute, vesture as the ovary, much shorter than the calyx, 3.5 mm. long and about as wide at the base.

Known only from the type.

Chachapoyas: Cerro Tinaja, alt. 3200 m. Ochoa 1686 (US).

Close to C. rugulosa Edwin, from which it differs in leaf-size, vesture (orange punctations beneath), style length and anther size and shape.

Calceolaria deflexa R. & P. var. aurantiaca Edwin, var. nov.

Frutex scandens, corolla aurantiaca differt a typica foliis ovatis plerumque minus quam duplo longior quam latior, rare duplo longior.

Climbing shrub with orange corolla, differing from the typical variety in having ovate leaves usually less than twice as long as wide, rarely reaching twice as long as wide.

Ancash: Western slope of Cordillera Negra below Paso de Collán. Rocky slopes and banks, alt. 3650 m. Pennell 15478 (PH, type; US).

CALCEOLARIA DENTIFOLIA Edwin, sp. nov.

Frutex, densissime glandulosus in lignum folia pedicellum pedunculum et calycistubum, glandes in pubes frequenter 2-cellulosum, subsessiles vel sessiles; lamina sub-coriacea, ovata, marginibus irregulariter et acutissimo duploserratis; inflorescentia corymbosa; calycis lobi lance-elliptici ad lanceovatos, lobum anteriorum angustiorum quam ceterum, intus oscillatus, corolla magna, ad 45-50 mm. longa; loculi antherarum inaequales, magni, 6.5-7.5 mm. longi; stylus 6-7 mm. longus; capsula non visa.

Erect shrub, little branching on the upper half, wood, foliage, flower-stalks, calyx tube and calyx lobe margins densely beset with gland-tipped hair and with sessile or subsessile glands, the hair frequently 2-celled. Leaves subcoriaceous, short-petiolate, ovate, mostly 6010 cm. long and 2-4 cm. wide, long-acute to acuminate at apex, subobtuse and dimidiate at base, margins irregularly and very sharply, doubly serrate, midvein often conspicuously elevated beneath; petioles thickened, up to 1.3 cm. long; inflorescences simple or branching, corymbose, subtended by a pair of reduced leaves, terminal on the main stem and on branches from the upper leaf-axils; basal and intermediate peduncles 2-3 cm. long; pedicels much shorter than the peduncles; calyx lobes lance-elliptic to lance-ovate, long-acute to acuminate, the anterior lobe narrower than the others, ca. 10 cm. long and 4-6 cm. wide, sparsely puberulent externally, oscillate internally, oscillae sunken; corolla large for the genus, yellow, upper lip sparsely puberulent, hooded, up to 10 mm. long, much over-topping the genitalia, lower lip 30-35 mm. long and up to ca. 25 mm. wide, saccate most of its length, externally sparsely puberulent or glandular with sessile glands, the vesture in patches, occasionally glabrous, internally with a tuft of hair at the base; filaments about 3 mm. long, very thickened, flattened, about 2 cm. wide, anther cells unequal, large, each pair 6.5-7.5 mm. long; style ca. 7 mm. long, thickened, apically incurved; stigma enlarged or not, punctiform-capitate, ovary glutinous, sparsely glandular, glands golden, sessile; capsule not seen.

Cajamarca: Shrub, along stream E. of Cordillera de Cumulloa on road to Celendin, alt. 3400-3500 m. Pennell 15162, (US, type; PH); Cajamarca-Celendin road, km. 90, Olsson s.n., February 11, 1948. Leaves sticky.

Close to Calceolaria endopogon Kranzl. and C. salicifolia R. & P., differing from both in vesture. In addition this taxon differs from C. engopogon in leaf-margins and in the structure of the inflorescence. Calceolatic entifolia differs from C. salicifolia also in leaf-shape and petiole length.

CALCEOLARIA FLOSPARVA Edwin, sp. nov.

Herba prostrata; caules et rami plerumque glabri; lamina longe petiolata; petiola usque ad fere longitudinem laminarum; calyx glabrus; corolla lutea 6-7 mm. longa labium superum vix brevior quam inferum; flores pedicellati; capsula ovoidea, colla nulla.

Prostrate herb, rooting at the nodes, stems and branches glabrous or almost so. Leaves mostly long-petiolate, ovate in outline, blades mostly 1.5-2.8 cm. long and 1.3-2.2 cm. long and 1.3-2.2 cm. wide, densely to thinly pulverulent beneath, irregularly coarsely dentate, laciniolate-dentate and varying to with 1 or 2 pairs of lobes, the lobes irregularly laciniolate-dentate; the narrowed base decurrent the length of the petioles that are at least one-half as long as the blade to almost as long; flowers axillary in upper leaves usually a pair in each axil, pedicellate, only rarely pedunculate; pedicels glabrous, 1.5-2.0 cm. long; calyx glabrous, lobes ovate, subobtusate, about 5 mm. long and 3 mm. wide, margins very sparsely crenulate; corolla yellow, glabrous, 6-7 mm. long, lower lip only little shorter than the almost wholly saccate upper lip; both anther cells fertile and much smaller than the thickened connective; style about 1.5 mm. long; capsule broadly ovoid, little shorter than the calyx, pubescent, neck lacking.

Amazonas: Rocky stream in mountain forest, alt. 3300 m. above Colcamar, Pennell 15633, (PH, type; F; US).

Thus far found only in Dept. Amazonas. In seepages, infrequent, uppermost slopes and summit of Cerros de Calla Calla, near Kms. 403-407 of Balsas-Leimebamba road, alt. 3400-3550 m., Wurdack 1711.

The combination of very small corollas with upper lip only little smaller than lower lip, almost wholly pedicellate flowers, generally glabrous inflorescence and long-petiolate leaves is not found anywhere else in this subgenus.

CALCEOLARIS GRANDIPINNATA Edwin, sp. nov.

Herba laxa, caulis pubescentiis pilis multicellulis. laminis pluripinnatis vel pluripinnatifidis, ad 23 cm. longis; nodis et

supranodis dense pubescentiis, pilis atrobrunneis; corolla glandulosa, glanderubra, sessili; capsula pubescentia, deltoideovata, collia nulla.

Soft herb, branching above the middle, stems pubescent with multi-cellular hairs and these frequently thickened and filled with a dark-brown exudate above and at the nodes. Leaves up to 23 cm. long, narrowly ovate to elliptically ovate in outline, very variable, multi-pinnate or -pinnatifid over all or most of their length, pinna sessile or less often stalked, irregularly dentate-laciniate, sometimes the upper part of the leaf merely dentate, pinnae most often reduced in size toward the apex, alternate or opposite, apically acute or long-acute, pubescent on both surfaces with multicellular hairs, these often appressed on the upper surface, long- or short-petiolate; petioles thinly connate; inflorescences simple or once-branched cymes, borne in pairs on the branches, from the axils of the uppermost leaves; basal peduncle up to 3-4 cm. long, mostly varying in length, densely and laxly gland-tipped-pubescent; pedicels pubescent as the peduncles, abruptly much shorter than the peduncles; bracts and bractioles reduced, lanceolate, otherwise leaf-like; calyx lobes broadly ovate or deltoid, ca. 3-4 mm. long and ca. 3 mm. wide in flower, becoming 9 mm. long and 6 mm. wide in fruit, acute, densely pubescent externally, less so internally, margins entire with the terminals of the veins little protuding; corolla yellow, more or less densely beset with sessile, red glands externally, 13-15 mm. long, upper lip ca. 4 mm. long, hooded, margins rounded, lower lip a little narrower than long, saccate almost its entire length, nectary small, entire hemispherical, terminal on the internally glabrous sac; one anther cell sterile, the other fertile, almost globular, the connective between the two longer than either cell and thickened, filament knoblike; style ca. 2.5 mm. long, pubescent near the base, ovary pubescent; capsule as long as or longer than the calyx, broadly triangular-ovate, pubescent, style persisting at the acute apex, neck lacking.

Type: Piura: Stream ditch, alt. 1000 m., below Canchaqui, Pennell & Ferreyra 14891, (US, type; PH;US).

Distributed in Piura near Canchaqui alt. 1000-1400 m., in wet places, Pennell and Ferreyra 14892; Ferreyra 3091.

Easily separable from all other Calceolarias by the combination of pluripinnate, very long leaves and the peculiar nodal pubescence.

CALCEOLARIA HEDERA Edwin, sp. nov.

Fruticulus scandens ligno juvenalo tomentoso, lamina subta

et pedicelli et pedunculi lanati; lamina lateovata vel interdum subrotundata margines revoluti, plerunque lateraliter 2-jugo lobarum ad apice uno lobis; flores solitarii axillarii vel in 3-flores dichasia praedita; loculi antherarum aequali distaliter apicem versus.

Climbing shrub with the lax branches and the nodes distant, young wood tomentose, tomentum decreasing with age until wood almost glabrous, foliage beneath and flower stalks densely lanate. Leaves mostly very broadly ovate in outline, less often almost subrotund, mostly up to 9 mm. wide, sometimes reaching 2 cm. wide, only very rarely exceeding 2 cm. long, mostly up to 15 mm. long, margin revolute, with usually 2 pair of lateral lobes and a single apical lobe, varying to 1 or 3 pair of laterals, lobes rounded, usually minutely cordate at base, occasionally truncate or broadly obtuse, pilose above, densely lanate beneath, the indument matted, obscuring the tissue; flower-stalks up to ca. 2 cm. long, usually less, not infrequently less than 1 cm. long, occasionally the flowers subsessile: flowers solitary and axillary or in 3-flowered, simple dichasia, branches floriferous over half their length, floral leaves similar to cauline, only little reduced; the short calyx tube and lower parts of the calyx lobes externally densely tomentose, vestiture decreasing to the apices of the lobes, internally sparsely pubescent, lobes elliptically, broadly ovate, ca. 6 mm. long and 5 mm. wide, acute, entire; corolla yellow, wholly glabrous or with a very few hairs internally at the base of the lower lip, 14-17 mm. long, upper lip 1-2 mm. long, lower lip saccate more than half its length, sac broadly, abruptly expanded, much wider than the non-saccate part; anther cells equal, divaricate, 2 or more times longer than wide, the up-turned distal ends furthest from the floor of the corolla, each pair of cells 2-3 mm. long, filaments about 1.0-1.2 mm. long, about half the length of the thickened 2.0-2.5 mm. long style, ovary glandular- or granular-pubescent; capsule unknown.

Known only from the type collection.

Cajamarca: springs in hills, midway between Cordillera da Cumulloa and Celendin, alt. 2700-3000 m. Pennell 15221, (US, type, PH).

The leaves are much like the common "ivy" in shape. This taxon is related to C. cordiformis and C. triloba Edwin but is most easily separable at least at present. Although most of the leaves of this taxon are less than 1 cm. wide, the largest blades indicate the strong possibility that future collections may uncover specimens whose leaves are more than 1 cm. wide.

CALCEOLARIA HUMILIS Edwin, sp. nov.

Frutex parvus, ramosus, caudex incrassatus; folia parva, omnino pulverulenta, brevipetiolata ovata usque ad 1.5 cm. longa et 0.9 cm. lata crenulata-serrulata plana; corolla 9-11 mm. longa. labium superum annulo reductum, inferum saccata minus quam medio, pars proximo fera lato quam distalo; stamina parvis, antheris aequalis divergentis vel divaricatis 2 mm. longis et 1 mm. latis.

Small, branched shrub from a thickened rootstock, several stems rising closely grouped, lower nodes longer, upper sometimes shorter than the small leaves, wood drying wine-red, puberulent as the pedicels and calyx lobes. Leaves small, ovate, up to 1.5 cm. long and 9 mm. wide, short-petiolate, pulverulent on both surfaces and often puberulent above, yellow-green, glandular beneath, crenulate-serrulate, plane, acute at apex, sub-acute to subobtuse at base, widest near but not at the base, venation subobsolete and impressed above, prominent and elevated beneath, often with flattened, white puberulence; flowers solitary; crowded, axillary to upper leaves and terminal on the branches and stems; pedicels reddish under the white puberulence, ca. 1 cm. long; bracts leaf-like, reduced; calyx lobes ovate, 3-4 mm. long and almost as wide at base, internally puberulent on the red margins, yellow-green glandular on the light green tissue, acute; corolla yellow, 9-11 mm. long, upper lip reduced to a ring less than 1 mm. long; lower lip papillose on both surfaces, saccate less than one-half its length, the proximal part only little narrower than the distal, saccate part; filament ca. 1 mm. long, thickened; anther cells equal, divergent or divaricate, each pair 2 mm. long and 1 mm. wide; style ca. 1.0-1.5 mm. long, thin; ovary papillose-glandular; fruit not seen.

Cajamarca: Open jalca, southwest slope, Paso de Gavilán, S. of Cajamarca, alt. 3100-3300 m., Pennell 14953 (PH); Bushy ravine on Jalca, southwest slope, Paso de Gavilán, S. of Cajamarca, alt. 3100-3200 m., Pennell 14951. --Ancash: Matahuanca, ca. 20 km. S. of Huaraz, alt. 4000 m., Rick s.n.

Close to *C. inamoena* Kranzl. which differs in having flowers in dichasia, much more deeply toothed or lobed leaves and very different indument.

CALCEOLARIA HUTCHISONII Edwin, sp. nov.

Herba erecta, ramosa, caules et rami densissime puberulenti superi, sparse puberulenti ad subglabri infer; lamina latissime ovata, frequenter latior quam longior, plerumque 0.8-2.0 cm. longa et 1.0-2.2 cm. lata, dentes distanter crenatidentati, subcoriacei, densissime brevissime puberulenti superi, denissime pulverulenti inferi; inflorescentis 1-2x ramosa; et pedunculi et pedicelli usque ad 1.0 cm. longi et bractea et bracteola

deficiens; corolla extus dense papillosa-glandulosa; stamina parva, filaments vix 0.5 mm. longa, antherae ca. 2.5 mm. longae, loculi equales, divergenti, longiores quam latiores.

Erect branched herb to 1.5 m. tall, stem drying red-brown, striate on upper part, closely puberulent above to sparsely so or almost glabrous below. Leaf blades very broadly ovate, sometimes to often wider than long, the longest up to 2.5 cm. long, mostly 0.8-2.0 cm. long, and 1.0-2.2 cm. wide, narrowed apically, very broadly obtuse basally, margins coarsely, irregularly crenate-dentate, teeth usually few, distant, densely and closely puberulent above, densely tomentulose-pulverulent beneath, drying dark-green above, much paler beneath, subcoriaceous, short-petiolate; petioles densely pubescent, up to 6.0 mm. long, thinly connate across the nodes; inflorescences paired, from the uppermost leaf-axils, usually in irregular, 1-2x branched, subcymose clusters; flowers-stalks short, often less than 1 cm. long, densely puberulent, bracts and bracteoles lacking; calyx lobes ovate, 4.0-4.5 mm. long and 3.0-3.5 mm. wide, acute to obtuse, densely, closely puberulent on both surfaces, calyx tube puberulent; corolla yellow, densely papillose-glandular externally, 13-17 mm. long, upper lip annulate, 2-3 mm. long, lower lip saccate about half its length, internally proximally beset with long, white hair; stamens very small, filaments hardly 0.5 mm. long, anthers ca. 2.5 mm. long, cells equal, divergent, a little longer than wide; style 1.5-2.0 mm. long, very thickened on lower half, incurving to the upper lip from its base; ovary glandular; capsule not seen.

Piura: Huancabamba Prov., 18.5 km. above Huancabamba, on road W. to Piura, alt. 3200 m., Hutchison and Wright 6630, (F, type; UE; US; USM).

Piura: El Tambo, road between Piura and Huancabamba, alt. ca. 3000 m., Scolnik 1407; Above Huancabamba alt. 3200-3300 m., Weberbauer 6048.

The very short filaments, very broad leaves, compound inflorescences and very thickened style form a combination of characters not seen in any other species in the genus.

CALCEOLARIA LEUCANTHA Edwin, sp. nov.

Differt a Calceolaria ballotifolia Kränz. frutex scandentis glabris inflorescentiis excepte, laminis subtis rubropunctis parvior quam C. ballotifolia; labiis inferis corollae saccatis ca. one-third eis longitudinis.

Differing from C. Ballotifolia Kränz. to which it is very closely related in the following ways; wood and foliage glabrous,

leaves 0.8-5.5 cm. long and 0.5-1.6 cm. wide, densely red-punctate beneath; lower lip of the corolla saccate only about one-third its length.

Tall shrubby climber, glabrous except for the peduncles, pedicels and calyces, older wood unisulcate. Leaves ovate, very coarsely dentate, asymmetrical, acute at apex, obtuse to sometimes cordate at base, short-petiolate; inflorescences dichasiate or corymbose, few-flowered, terminal on the branches or in upper leaf axils; basal peduncles 3-5 times longer than the remaining flower stalks; calyx tube and the lower part of the lobes pubescent; corolla white, drying yellow.

CALCEOLARIA LINEARIOIDES Edwin, sp. nov.

Frutex, erectus vel ad apicem nutans. Lamina latelinearia vel anguste-ellipticeovata 4-8 mm. lata, manifeste venosa et supera et infera; inflorescentia racemosa vel racema; pedicelli 1-2 cm. longi; lamina interfloralia minus quam caulina; anthers 4-5 mm. longs 2-3 plo longiora quam latiora, loculi inaequales, divergenti; capsula quam calyx longior, puberulenta, angustata ad collum longum apex obtusus.

Shrub, erect or apically nodding, stems and branches densely puberulent or sometimes also glandular-puberulent. Leaves puberulent on both surfaces, more so beneath, short-petiolate, broadly linear or narrowly, elliptically ovate, 1.0-2.5 cm. long and 4-8 mm. wide, margins few-serrulate on the upper half, often thinly revolute, apex acute or subacute, base acute or long-acute, venation visible, impressed above, elevated beneath; petioles ca. 1 mm. long, vesture as the blades, those of the stem and principle branches swollen and often with reduced leaves or abbreviated shoots in the axils; inflorescences racemose or true racemes, borne in upper leaf-axils; pedicels puberulent, ca. 1-2 cm. long; interfloral leaves reduced, otherwise as the cauline; calyx lobes sparsely puberulent on both surfaces or internally glabrous, broadly ovate, acute 4-5 mm. long, almost as wide near the base; corolla yellow, sometimes red-marked within near the base, upper lip 2-3 mm. long puberulent or papillose, lower lip glandular-puberulent beneath on the non-saccate proximal part or papillose beneath along its length, sometimes with a tuft of long white hairs at the base within, ca. 11-15 mm. long, saccate a little less than half its length; anthers large for the corolla, 4-5 mm. long, cells unequal, 2-3 times longer than wide, divaricate; style 2-3 mm. long, apically curved, ovary puberulent or sparsely glandular with fugitive glands; capsule ovoid, a little longer than the calyx, puberulent, narrowed to a long neck, apex obtuse.

Pasco: Yanahuanca, northwest slope, alt. ca. 10,000 ft.,

Macbride Featherstone 1184 (F).

Cajamarca: Dry banks (volcanic soil), alt. 2900 m., 15-20 km. above Cajabamba, Pennell & Ferreyra 14855.

Very close to Calceolaria linearis R. & P., differing only as in the key. The species is proposed also because of the distance between the two collections, possibly indicating wider occurrence in North Central Peru.

CALCEOLARIA LONGIINTERNODIA Edwin, sp. nov.

Herba alta, pauciramosa ad apicem, internodia ca. 4-5 plo longiores quam lamina; laminae oppositae vel ternatae, angustae ad lanceolatae, dense tomentosae, marginibus valde dentatis; calycis lobi 7-9 (-10) mm. longi; corolla 24-30 mm. longa; anthera interdum dimorpha, plerumque 2 plo longior quam latior.

Tall herb, branching near the apex, branches swollen at base, nodes, especially the lower, several times (ca. 4-5x) longer than the largest leaves, stems drying dark to purple-brown, striatulate, mostly glabrous except hirsute-puberulent in the inflorescence; leaves opposite or ternate, blades narrowly ovate to lanceovate, densely tomentose and pale-green beneath, glabrous, darker and dull-green above, very variable in size, the major leaves 4-6 cm. long and usually 1.5-3.0 cm. wide, margins very coarsely dentate, apex long-acute, variable at base; petioles up to 6 mm. long, densely tomentose, often with abbreviated shoots or reduced leaves at base in the axils; peduncles and pedicels densely tomentose, the longest peduncles ca. 4.5 cm. long, once or twice branching, forming dichasia, pedicels about half as long or less than half as long as the peduncles; inflorescences on upper part of stem, terminal on the branches; calyx lobes broadly ovate, 7-9(-10) mm. long, acute, entire, externally densely puberulent, internally puberulent with a row of hairs near the margin; corolla yellow, 25-30 mm. long, upper lip ca. 4-6 mm. long, lower lip externally pustulate, internally with a tuft of hair at the base, 21-24 mm. long, saccate less than half its length; anthers on short filaments, cells equal or a little unequal, sometimes dimorphic in a flower, mostly at least 2 times longer than wide, less often only little longer than wide to almost as wide as long, each pair of cells 4.5-5.5 mm. long; style a little thickened, erect, ca. 4 mm. long; ovary glandular.

Ancash: Herb, banks near stream Tinco, alt. 3400-3650 m., E. slope of Cordillera Negra opposite Huaraz, Pennell 15468, (US, type: PH).

Close to C. impressifolia Edwin, from which it differs in

leaf and anther shape and C. hirsutula Pennell and C. bicrenata R. & P. The former very fine teeth and the latter differs in leaf-shape. C. longiinternod differs from all other Calceolarias in the combination of dimorphic anthers, leaves about three times as long as wide with coarsely dentate margins and calyx lobes usually 7-9 mm. long with a distinct row of hairs internally near the margins.

CALCEOLARIA LOPEZII Edwin, sp. nov.

Herba erecta, mollis, caules, rami, pedunculi et pedicelli dense pubescenti, pubis glandulosis, glandules parvula et plerumque caduca. Inflorescentia dichasia; calycis lobi intus glabri, venae parallelae; corolla glabra, labium superum plus quam medio labium inferum; filamenta ca. 4 mm. longa; anthera bilocularia; stylus glabrus elongatus, 4.5-5.0 mm. longus; stigma parvissima; ovarium in sicco atrorubrum.

Soft erect herb, branches and leaves opposite, stems branches and flower-stalks more or less densely pubescent with gland-tipped hairs, glands small and frequently fugitive in age, hairs white of intermixed, varying sizes, upper nodes bearing densest vesture. Uppermost leaves sessile, others short-petiolate, blades ovate, mostly 2.8-4.1 cm. long, sometimes shorter, and 2.0-3.8(-4.4) cm. wide, sometimes narrower, dentate-denticulate, apex acute, base obtuse to truncate, occasionally cordate, subglabrous to sparsely puberulent with 2-celled hairs, mostly concentrated on the margins and the veins above, chartaceous, a little paler beneath than above, both surfaces dull green; petioles only 1-2 mm. long, rarely a little longer, vesture denser than the blades; inflorescences termination on stem and axillary or terminal on the branches with a pair of reduced bract-like leaves at the base of the peduncle, simple or branched dichasia; calyx lobes externally sparsely pubescent, margins ciliate, internally glabrous, main veins parallel, ovate to elliptical, 2.3-3.0 mm. long and 1.2-2.0 mm. wide, acute; corolla yellow, 12-22 mm. long, almost completely glabrous, upper lip more than half the length of the lower, 7-8 mm. long, lower lip 11-13 mm. long and 7-9 mm. wide, saccate about half its length; filaments about 4 mm. long, flattened, with one main vein, anthers bilocular, locules very small, each anther about 1 mm. long, usually smaller, a little longer than wide; style glabrous, elongate, 4.5-5.0 mm. long, thin, stigma very small, scarcely wider than the style, ovary drying dark red; capsule not seen.

Livertad: Cerro Campana, Prov. Trulillo, alt. 500 m., August 9, 1948, Lopez 0221, (US); Same location August 21, 1949, 420 m. alt., Angulo 0698.

Close to Calceolaria utricularioides Benth., differing in

having deeper teeth on the blade margins, shorter filaments and in the development of an inflorescence. This latter only rarely seen in C. utricularioides.

CALCEOLARIA LUTEOCALYX Edwin, sp. nov.

Frutex scandens; lamina ovata vel ellipticeovate; petioli 8-18 mm. longi; inflorescentia ad basim dichotoma ramosa, ultimi rami cymosi; bractea foliosa; pedunculus basalis 5-9 cm. longus, intermedii ca. one-half - two-thirds quam basali; pedicelli vix breviores quam intermedii pedunculi; calyx luteus, lobi interdum latiores quam longiores; corolla glabra, saccata minus quam media, pars provima vix angustior quam distala; antherae subsessiliae, aequales.

Climbing shrub, main branches and stem canaliculate at least part way, young wood densely, older wood sparsely puberulent. Leaves petiolate, blades ovate or elliptic-ovate, mostly 2.0-4.0 cm. long and 1.5-2.2 cm. wide, usually not twice as long as wide, narrowed at both ends, margins coarsely, irregularly serrate-dentate; petioles densely pubescent, mostly 0.8-1.8 cm. long, basally little thickened and thinly connate across the nodes that are frequently much longer than the leaves; inflorescences arising from the upper leaf-axils, basally dichotomously branched, ultimately 3-flowered cymes, basal branching sometimes wanting, then the inflorescences simple or once-branched cymes; bracts and bractlets foliose, reduced; basal peduncles 5-9 cm. long, secondary peduncles ca. one-half - two-thirds as long as the basal; pedicels little shorter than secondary peduncles, flower-stalks densely puberulent; calyx yellow, lobes subglabrous, sometimes broader than long, broadly ovate, obtuse, 7-8 mm. long and 7-9 mm. wide, margins sinuate or irregularly broadly crenulate and sparsely ciliolate, calyx tubes sparsely to densely puberulent; corolla yellow, wholly glabrous, upper lip 3 mm. long with hood 1 mm. long, lower lip 18-22 mm. long, saccate less than half its length, proximal, non-saccate part only little narrower than distally; anther cells equal, ca. 2 mm. long, divaricate, subsessile, filaments ca 0.3-0.5 mm. long and about as wide; style ca. 2.5-3.0 mm. long, thickened, ovary pubescent, flattened; capsule not seen.

Known only from the type of collection.

Amazonas: Forest, alt., 3000 m. Cerro Puma-urco, SE. of Chachapoyas, Pennell 15549, (PH, type; PH).

This species differs from all other taxa in the genus by virtue of the following combination of characteristics: calyx yellow, with lobes often wider than long, non-saccate part and the anthers subsessile.

CALCEOLARIA MACULATA Edwin, sp. nov.

Herba scandentia ramis oppositis, ramulis et ramis juvenalis dense pubescentis veteribus dense puberulentis. Folia brevipetiolata subtus dense ferruginea, eglandulosa, tomentosa, supra pilis brevioribus pubescentis plerumque glandulosis; nodosa indurate; calycis lobi extus dense pubescentis, intus pilis marginatis aggregata; corolla intus rubro-vel ferrugineo-maculata, labium inferus saccata solus one-third ad one-fourth ea longitudina, distaliter 2-sulcata, saccus 3-lobatus; antherarum loculi aequales; capsula quam calyx brevior.

Climbing herb with opposite branches, young stems and branches densely pubescent older densely puberulent, internodes longer than the leaves. Leaves short-petiolate, densely eglandular, ferruginous-tomentose beneath, densely pubescent above with shorter, frequently glandular hairs, ovate, grossly dentate, apex acute, base broadly obtuse to subtruncate, mostly 1.8-3.0 cm. long and 1.0-1.9 cm. wide; petioles up to ca. 8 mm. long, densely pubescent, those of the stem leaves thick, indurate, woody, persistent, with the branches forming swollen nodes; flowers clustered at the apices of the upper branches in irregular cymose or corymbose inflorescences; bracts and flower-stalks densely pubescent; basal peduncles up to 3 cm. long, intermediate peduncles and pedicels much shorter, frequently less than half as long; calyx lobes ovate, acute, 5.0-6.5 mm. long, almost as wide at base, externally densely pubescent, internally with a thick row of short hairs along the margins and a few scattered hairs on the lower third; corolla yellow, the internal surface of the lower lip red-brown marked or spotted and with a tuft of long white hair at the base, mostly 19-23 mm. long, less than half as wide, upper lip up to 2.5 mm. long, lower lip beneath externally sparsely puberulent, 16.5-22.0 mm. long, saccate only about one-third to one-fourth its length, the sac at the distal end with 2 short sulcations therefore appearing 3-lobate; stamens glabrous, filaments ca. 1.5 mm. long, anthers ca. 3 mm. long, cells equal, almost twice as long as wide; style 1.5-2.0 mm. long, erect or little curved at apex, glabrous, most often thickened; ovary glandular with sessile, golden glands; capsule ovoid, obtuse, glandular, shorter than the calyx.

Known only from the type collection.

Cajamarca: Meadow E. of Celendin, alt. 2500-2700 m.,
Pennell 15215 (US type; PH).

This very distinct taxon is probably close to C. aperta Edwin, but easily distinguished from it. The corolla is very unusual.

CALCEOLARIA PALLASCENSIS Edwin, sp. nov.

Frutex dense lanosus. Lamina aggregata in nodis incrasatis linearia vel acicularia; inflorescentia simplex, cymosa; corolla lutea 7-11 mm. longa, labium superum minus quam duplo longior inferum; loculi antherarum fere oribiculari, inaequales, divarticati, filamenta perbrevia.

Erect, strictly branching from about the middle, mostly densely white-lanate nodose shrub, stems very densely lanate above, vesture decreasing basally, thickened at the closely spaced nodes. Leaves a little shorter to a little longer than the internodes, with the branches and flower-stalks strictly pointing upward, almost parallel to the main stem, sessile, linear or aciculiform, mostly 0.5-1.5 cm. long up to 2 mm. wide, densely lanate in the groove of the costa and varying to densely puberulent-pustulate on the tissue, the puberulence minutely gland-tipped, the bases of the outermost leaves at each node thickened, mostly with very abbreviated shoots in the axils, the leaves appearing clustered, occasionally the shoots a little elongated, margins revolute, entire, apex hammate, tissue thickened, venation obsolete; inflorescences terminal on the main stem and branches and in the uppermost leaf-axils, simply cymose; pedicels 5-10 mm. long, densely lanate; calyx tissue thickened, calyx lobes externally densely lanate, internally glabrous or minutely glandular-puberulent, or with a line of hairs near the margin, 3 segments broadly ovate, the fourth segment elliptically ovate, 4.0-4.5 mm. long and ca. 3.0 mm. wide or 5.0-5.5 mm. long and 2.0 mm. wide, all acute; corolla yellow, glabrous or often minutely puberulent, 7-11 mm. long, upper lip 3-4 mm. long, hooded but not obscuring the genitalia, lower lip saccate about half its length, sac distally crenulate, internally glabrous; anther cells large for the corolla on very short filaments, divaricate, unequal and almost orbicular; style 2.5-4.5 mm. long, curved; ovary granular; fruit not seen.

Known only from the type.

Ancash: Laguna de Pelagatos, Prov. Pallasca, 4300 m. alt., Lopez 2400, (LA).

Unequal almost orbicular anther cells are rare in the genus. This characteristic along with the very small corolla, simple inflorescence, dense woolly vesture and very narrow leaves aggregated in nodose masses renders the taxon quite distinct.

CALCEOLARIA PHACELIAEFOLIA Edwin, sp. nov.

Petiola one-third - one-fourth longitudina ad fere longitudina laminarum; margina laminarum 2-4-jugis lobarum; pedunculi, pedicelli et calycis lobi puberulenti, pilis glandulosis;

inflorescentia irregulariter ramosa, pauci-ad pluri-floribus, corymbosa vel paniculata, rami ultimi cymosi vel dichasiati; labium inferus corollarum saccatus minus quam medio ea longitudinarum; antherarum loculi plerumque inaequales, una ea seape fere obsolita, rarissime loculi aequales; capsula brevior quam calyx, glandulosa.

Subshrub drying back to near the ground or occasionally an herb or small shrub, usually branching over much of its length, younger stems puberulent, often with mixed glandular eglandular hair, older stems at length glabrate. Leaves petiolate, ovate in outline, very variable in size, mostly 1-3 cm. long and 0.8-2.5 cm. wide, in herbaceous material up to 6 cm. long and 5 cm. wide, margins with 2-4 pairs of irregular lobes, these sometimes secondarily toothed, long acute at apex, obtuse to subtruncate at base, puberulent above and beneath with gland-tipped hairs; petioles sometimes almost as long as the blades, most often one-third - one-fourth the length of the blades, glandular-puberulent to -pubescent; inflorescences variable, corymbose to paniculate, when paniculate, the ultimate branchings cymose or dichasiate, few- to many-flowered, usually terminal on the branches; bractlets very reduced, leaf-like, ca. 0.5 mm. long, lobes short, 1-2 pairs; basal peduncles 3-10 times longer than the remaining flower-stalks, peduncles and pedicels gland-tipped-puberulent, sometimes densely so; flowers variable in size, 22-40 mm. long when dry, only up to one-half as wide; calyx lobes ovate, acute, 7-9 mm long and 4-6 mm. wide, internally and externally gland-tipped-puberulent; corolla yellow, 20-34(-38) mm. long, externally sparsely to densely very short-puberulent, the hairs gland-tipped, upper lip very short, ca. 2-4 mm. long, not hiding the stamens and stigma, lower lip 20-35 mm. long, distally saccate less than one-half its length, the proximal part abruptly much narrower than the upcurving sac, internally long-pubescent with white hairs at the base; stamens with filaments ca. 1.5-2.5 mm. long, anther cells unequal or very rarely equal, saggitate, the larger of each pair about 3 mm. long and 1.0-1.5 mm. wide, the other cell from subobsolete to about three-fourths as large, often varying from flower to flower on a single plant, when almost lacking reduced to a sterile flap at the apex of the filament, the stamen appearing uniloculate unless magnified (ca. 30x); style erect, 2.5-3.0 mm. long, ovary glandular; capsule ovoid, little shorter than the calyx, apically narrowed, style persisting.

Ancash: Shrub; bushy banks, alt. 3200-2500 m., N. of Chancos, Pennell 15320, (US, type; PH).

Ancash: Tranca, near Chiquian, alt. 3220 m., Ferreya 5691; Capillapunta, mountain S. of Chiquian, alt. 3540 m., Ferreya 5732; Mountain E. of Chiquian, alt. 3500-3550 m., Ferreya 7334; 7342 (herbaceous); Marcara, Prov. Huaraz, alt. 3000 m.

Nunez 3234; stream bed, S. of Huaraz, alt. 3100 m., Pennell 15263; Monterrey, 3 km. below Huaraz, alt. 3000-3100 m., Pennell 15309; Bushy, rocky slope along stream, S. of Río Santa, alt. 3100-3150 m., opposite Huaraz, Pennell 15328; Sandy banks, alt. 3400-3450 m., Cerro Shaurena, SE. of Huaraz, Pennell 15352; Low mountain toward El Huascaron, N. of Yungay, alt. 2850-2900 m., Pennell 15422 (anther cells equal); Summit of Cerro Shaurema, SE. of Huaraz, alt. ca. 3500 m., Pennell 15428; Bed of Quebrada de Huaqui, alt. 3000-3050 m., N. of Huaraz, Pennell 15436; Hills N. of Huaraz, alt. 3100-3150 m., Pennell 15438; Jalca, E. of slope of Cordillera Negra, opposite Huaraz, alt. 3600 m., Pennell 15464. -- Lima: Chicla between San Mateo and Casapalca, alt. 3700 m., Ferreyra 6515; Rimac Valley, alt. 4000 m., Rauh-Hirsch P1794.

This species is easily separated from the other members of the genus by the combination of very unequal anther cells, deeply lobed leaves, long petioles and the irregularly varying inflorescence.

CALCEOLARIA SEUDOSABRA Edwin, sp. nov.

Caules et rami glanduloso puberulenti; lamina glandulosa vel eglandulosa, sessiles vel brevipetiolati, 2.0-3.5 cm. longi et 1.0-2.1 cm. lati; inflorescentia cymosa, paucifloribus; labium inferus corollarum extus brevi-glanduloso-puberulentum; loculi antherarum inaequales, divericati saepe duplo langior quam latior; ovarium glandulosum; capsula ignota.

Coarse perennial herb, erect and branched, foliage, stems and branches drying brown, stems and branches glandular-puberulent. Leaves mixed glandular and eglandular-puberulent, sessile or less often short-petiolate, ovate to broadly elliptically ovate, mostly 2.0-3.5 cm. long and 1.0-2.1 mm. wide, margins revolute, crenate, narrowed to an obtuse apex, base broadly obtuse, tissue scabrous, costa elevated and prominent beneath; young inflorescences arising in pairs from the upper leaf-axils, cymose, few-flowered; peduncles glandular-pubescent, 2-5-times longer than the pedicels; bracts and bracteoles reduced floral leaves, bracts occasionally with a pair of lobes near the base; calyx lobes mixed glandular- and eglandular-pubescent on both surfaces, elliptic-ovate, long-acute, 4-5 mm. long and ca. 3.5 mm. wide; corolla yellow, upper lip glabrous, 1-2 mm. long; lower lip externally short-glandular-puberulent, saccate over most of its length, 13-15 mm. long and about 5 mm. wide, a tuft of white hairs present at base within; stamens short, anthers large for the small corolla, anther cells divaricate, unequal, usually at least twice as long as wide, the larger 1.8-2.0 mm. long, the smaller 1.2-1.5 mm. wide; style ca. 1.5 mm. long, thickened; ovary glandular; capsule unknown.

Cajamarca: Wet place, alt. 2700-29-- m., mountain E. of Celendin, Pennell 15213 (PH).

Closest to Calceolaria Scabra and C. variefolia, differing from the former in being a much coarser plant with larger leaves and from the latter in having the internodes much shorter as well as in growth form, herb as opposed to shrub.

CALCEOLARIA PUMILA Edwin, sp. nov.

Herba minima annua, dense glanduloso-pubescentia; caudex simplicissimus usque ad 6 cm. altum, 3-jugis foliorum opposita disposita; folia oblonga vel ovata, integra, sessilia, usque ad 1.2 cm. longa et 0.8 cm. lata, plerumque 0.9 cm. longa et 0.7 cm. lata, utrinque puberulenta-pubescentia; flores solitarii, terminali vel in axillaribus foliorum disposita flavi minimi, 7 mm. longi et 2-3 mm. lati; calycis lobi elliptici extus glandulosi, 3.0-3.5 mm. longi et 1.5-2.2 mm. lati; corolla lutea, labium superum 2 mm. longum, inferum 5 mm. longum, saccata lateraliter in toto longitudinem, medio fere 0.5 mm.; capsula elliptica longior quam calyx.

Tiny unbranched herb up to 6 cm. tall, the simple stem densely glandular-pubescent, bearing 1-3-pairs of oblong or ovate leaves. Leaf-blades sessile, entire, up to 1.2 cm. long and 0.8 cm. wide, usually reaching 0.9 cm. by 0.7 cm., puberulent-pubescent on both surfaces; flowers solitary, pedicellate, terminal or in the upper leaf-axils, tiny, up to 7 mm. long and 2 mm. wide, below; pedicels short, up to 7-8 mm. long, glandular-pubescent; calyx lobes elliptical, acute, 3.0-3.5 mm. long and 1.5-2.2 mm. wide, externally glandular-pubescent; upper lip of the glabrous corolla ca. 2 mm. long, lower lip 5 mm. long, sac laterally placed the length of the lip but only about 0.5 mm. thick medianly from the distal end; stamens very small, filaments thickened, less than 1.0 mm. long, anther cells equal, drying white to light yellow, each anther ca. 1.0-1.2 mm. long, each cell a little longer than wide, divaricate; style thickened, ca. 1.0 mm. long, ovary sparsely glandular-puberulent; capsule elliptical, sparsely glandular-puberulent, 6.0-6.5 mm. long and 2.0-2.5 mm. wide, much exceeding the calyx.

This taxon has the smallest flowers of any in Peru.

Known only from the type specimen.

Cajamarca: Rocky limestone on ridge 11 km. S. of Cajamarca, alt. 2750-2850 m., Pennell and Anderson 15078 (PH).

Since the sheet is not marked unicate isotypes are probable.

A unique taxon in the genus, at least in Peru. No close relative is known at this time.

CALCEOLARIA REICHLINII Edwin, sp. nov.

Differt a *C. cajabambae* Kranzl. densissimis argenteolanatis laminis et caycis-lobis, laminis plerumque linearis interdum lanceovatis marginibus plerumque integris; pedicellis et pedunculis usque ad 2 cm. longis; caycis-lobis intus glabris vel subglabris; corollis extus glabris vel pauciglandulosis, stylis 2-4 mm. longis et ovarii glandulosopubescentiis vel longi-pubescentiis vel raro pauciglandulosis.

Shrub erect and branched, wood, leaves, flower-stalks and calyces more or less densely beset with long, silvery, soft hairs (lanate), the leaves beneath and the calyx lobes most densely so, the vestiture sometimes fugitive with age, usually eglandular except occasionally for the corolla and frequently the ovary. Leaves most often linear or aciculiform, occasionally broadening to lance-ovate, sessile or almost so, the vestiture frequently completely obscuring the tissue beneath, margins mostly entire, revolute, obtuse apically, blades sessile; inflorescences 1-few flowered; flower stalks up to 2 cm. long, usually less; calyx-lobes elliptical or elliptically ovate, rarely ovate, 5-8 mm. long, and up to 4 mm. wide, acute, the tissue frequently completely obscured by the vestiture externally, glabrous or sometimes with a few hairs paralleling the margins or very rarely a few-glands present internally; corolla yellow, variable in size, 12-25(-28) mm. long, externally glabrous or few-glandular, rarely papillose, saccate more than one-half its length, internally glabrous; anther cells unequal, 2 or more times longer than wide; completely divaricate, each pair of cells up to 4 mm. long, septum thickened; style 2-4 mm. long, glandular at base; ovary glandular-pubescent or long-pubescent, rarely merely few-glandular; capsule narrowly conic-ovoid, about as long as the calyx, vestiture as the ovary, apex attenuate, style persisting.

Common in Dept. Cajamarca, in the Andes of northern Peru and 3 collections also seen just to the south in Dept. Libertad.

Cajamarca: Dry banks, (volcanic soil), 15-20 km. above Cajabamba, alt. 2900 m., Pennell & Ferreyra 14853, (PH, type; US); prov. Cajabamba, km. 38 N. of Huamachuco, near Cajabamba, alt. 2900-3000 m., Ferreyra 3044; on cumbre above Cajamarca, 3500 m. alt., Olsson 4 pro parte; Celendin-Balsas road-km. 124, Olsson 4a; mountain E. of Celendin, alt. 2700-3000 m., Pennell 15173; alt. 2400-2800 m., Pennell 15177; Rocky calcareous hillside, NE. of Cajamarca, alt. 2750-3850 m., Pennell & Anderson 15082; Cliff about 10 km. above Cajamarca, alt. 3200 m.,

Pennell & Ferreyra 14865; Open jalca, Paso de Gavilan, S. of Cajamarca, alt. 3000-3300 m., Pennell & Ferreyra 14959; Jalca SW. of Cajamarca, alt. 2700 m., Pennell & Reichlin 15034; alt. 2750-4000 m., on the Cajamarca-Celendin road, Scolnic 1308. -- Libertad: 2-3 km. above Otuzco, Trujillo-Otuzco road, alt. 2500 m., Ferreyra 2977; Sandy area, S. of Stuzco, alt. 2500 m., Pennell & Ferreyra 14820; km. 82 W. and below Agallpampa, alt. 2900 m., Pennell & Ferreyra 14832.

CALCEOLARIA RUGULOSA Edwin, sp. nov.

Lamina rugulosa vel rugosa dense pubescentia praecipue subta, petioli perbrevis incrassati brevi connati lignosi, corolla usque ad 1 cm. longa perbrevis saccata, stamina brevissima loculi antherarum aequales.

Erect, branched, pilose-tomentose shrub, stems appressed-pilose below, tomentose above, and with the leaves drying light brown, the leaves also sometimes drying brown-green, tomentum densest on young growth. Leaves opposite or ternate, ovate or elliptic-ovate, occasionally elliptical, (1.5-)3.0-5.0 cm. long and (1.0-) 2.0-3.5 cm. wide, margins plane, serrate to double serrate, sometimes grossly so, narrowed to an acute apex, obtuse to broadly obtuse at base, rugose or rugulose, pilose above, tomentose beneath, sometimes, especially when young, the vestiture obscuring the leaf tissue, often with golden yellow glands intermixed beneath; petioles 1-4(-6) mm. long, thickened, woody, densely tomentose, usually narrowly connate; inflorescences in upper leaf-axils and also terminal, many-flowered, compound dichasia or corymbose; flower-stalks densely long-soft-pubescent; bracts merely reduced leaves; calyx tube and lobes densely pilose externally, glabrous internally, lobes ovate or broadly ovate, acute, 6-8 mm. long; corolla yellow, up to 1 cm. long, externally very short-puberulent, internally glabrous; upper lip 1-2 mm. long; lower lip ca. 6-8 mm. long, saccate only 1-2 mm.; anther cells equal, each pair ca. 2.0-2.2 mm. long, almost twice as long as wide; style thin, glabrous, 1.0-1.5 mm. long, ovary glandular; capsule ovoid-conic, a little shorter and loosely invested by the calyx, apically long-acute, sparsely golden glandular.

Cajamarca: rock cliff below Llama, alt. 1800-1850 m., Pennell 15917, (US, type; PG); earth bank, Llama, alt. 1850 m., Pennell 15916.

This taxon is related to C. aperta Edwin, but it is morphologically quite distinct.

CALCEOLARIA SIMULANS Edwin, sp. nov.

Herba parva, erecta ad repens. Lamina supera pinnata vel duplopinnata; inflorescentia pauciflos simplex vel semel ramosa; corolla lutea, glabra, labium superum 1.5-2.5 mm. longum inferum 9-11 mm. longum, saccata plus quam medio; antherae parvae, loculi aequans vel minima inaequans contigui jugum 1.3-1.7 mm. longum divaricatum longior quam latior nigrum ad septum; capsula quam calyx longior sparse glandulose-puberulenta, colla elongata.

Herb, erect to repent, little-to much-branched, usually up to 25 cm. tall, sometimes only about 10 cm., upper parts of the stems and branches more or less densely glandular- and eglandular-pubescent, remaining parts of stems and branches glabrous to sparsely eglandular-pubescent; upper leaves once or twice pinnate, lower very variable, from dentate to lobed; pinna dentate, sparsely mixed pubescent beneath as the upper parts of the stems and branches; petioles 1-4 mm. long, pubescent as the lower surfaces of the pinnae; inflorescences terminal on the branches and stems, simple or once-branched, few flowered; bracts foliose, reduced; flower-stalks up to 2.5 cm. long, usually not exceeding 1.8 cm., vesture as the upper parts of the branches; flowers yellow, small for the genus; calyx lobes a little unequal, broadly ovate, 4-5 mm. long and 3-4 mm. wide, acute, venose on both surfaces, red at base, sparsely glandular-puberulent on the sinuate margins; corolla yellow, dark-brown dotted, glabrous, ca. 10-13 mm. long, upper lip 1.5-2.5 mm. long, lower lip 9-11 mm. long, saccate a little more than half its length, proximal, non-saccate part only little narrower than the distal, saccate part; stamens contiguous, small, anthers ca. 1.3-1.7 mm. long, little shorter than the filament, cells equal or slightly unequal, divaricate, little longer than wide, blackened basally near the septum; style very short, up to 1 mm. long, apically curved; capsule sparsely glandular-puberulent, longer than the calyx, lance-ovoid, abruptly narrowed to a long neck.

Ancash: Casca below Chiquian, Prov. Bolognesi, alt. 3100-3200 m., Ferreya 7307 (US).

Distributed sporadically from Ancash to Ayacucho and Ica.

Ancash: Chacchash near Chiquian, 3220 m. alt., Ferreya 5687. --Ayacucho: Pampalca between Huanta and Rio Apurimac, 3200 m. alt., open hillside, Killip & Smith 22210. --Ica: Pisco Valley, alt. 2900 m., Rauh-Hirsch P390. --Lima: Rio Blanco, wet E. slope, alt. ca. 15,000 ft., Macbride 3037.

This species has the foliage of subgenus Calceolaria and flowers of subgenus Cheiloncos. It is provisionally palced in the latter grouping. In Peru, thus far, this is the only known taxon bridging the subgenera.

CALCEOLARIA SOLANIIFOLIA Edwin, sp. nov.

Frutex, densetomentosus vel folia lanosa, calyx et corolla magna calycis lobi 11-14 mm. longi; corolla lutea, labium superum 4-6 mm. longum inferum ad 25 mm. longum; antherae magnae, loculi inaequans, septa et parietes incrassata, stylus 5.5-6.5 mm. longus; capsula quam calyx brevior; inflorescentia jugata in axilla foliorum supremorum ramorum disposita.

Erect, branched, densely tomentose shrub, up to about 2 m. tall. Wood, the oldest excepted, leaves, petioles flower-stalks and calyx bases densely beset with short, curled, white to brown, velvety, often matted hairs; leaves ovate, sometimes lanate, up to 8 cm. long and 5 cm. wide, rarely entire, mostly subentire to serrate-serrulate, apex acute, base obtuse, dark green above, light yellow-green beneath, veins very apparent to almost concolorous beneath; petioles 1.5-2.5 cm. long, thickened, very densely pubescent; inflorescences a pair of compound, cymose dichasia, in the axils of the uppermost leaves of the stem and branches; basal peduncles up to 8 cm. long, intermediate flower-stalks and pedicels abruptly decreasing in length, ultimately less than 1 cm. long; flowers large for the genus; calyx lobes ovate to elliptic, acute, 10-14 mm. long 3-7(-8) mm. wide at base, yellow or light green in life, glabrous to sparsely pubescent externally, the hairs on or near the margins; corolla yellow, frequently minutely papillose, upper lip 4-6 mm. long; lower up to 25 mm. long, frequently 20-22 mm., saccate about one-half its length, the sac ovoid-oblong, 12-14 mm. wide, inflated in life; anther cells a little unequal in length and very unequal in shape, walls and septa thickened, both cells at least 2 times longer than wide, each anther 7-8 mm. long, the smaller cell 3.0-3.5 mm. long; style 5.5-6.5 mm. long, apically curved, ovary ovoid, pubescent, a little shorter than the style; capsule pubescent, ovoid or elliptic-ovoid, shorter than the calyx, acute apically.

Amazonas: Prov. Chachapoyas: E. side of Cerro Calla-Calla on lower and middle slopes. Jalca interfingered with loma and montane forest, alt. ca. 2800-3200 m., Edwin 3628, (F); 3626; 3630; mountains E. of Balsas, alt. ca. 3200 m., Osgood & Anderson 76.

This taxon is distinct from all other Calceolarias in having the combination of unequal anther cells, large corolla, dense tomentose or lanate pubescence, large thickened leaf-blades on long petioles and paired inflorescences, arising from only the uppermost pair of leaf-axils of the stems and branches.

CALCEOLARIA SONCHENSIS Pennell ex Edwin, sp. nov.

Herba pubescentia usque ad 5-6 cm. alta, caulibus squarrosis,

sulcatis-striatis. Laminae foliorum lateovatae vel triangulari-ovate petiolata suprema excepta ea sessiles untrinque pubescentiae 2.5-4.5 cm. longae, 1.5-2.3 cm. latae irregulariter duplodontatae; petioli alati connati prope caules latissime integri vel minuteserrati; inflorescentiae cymosodichasiae, sepala 10-12 mm. longa ovata acuta vel frequenter acuminata marginibus distanter vel dense serratis dentibus spinosis nigris; corollae luteae parvae labia subaequales 7-8 mm. longa et lata.

Pubescent herb up to 50-60 cm. tall, stems square, sulcate-striate. Leaves bizarre, blades broadly ovate or triangular-ovate, 2.5-4.5 cm. long and 1.5-2.3 cm. wide, irregularly doubly dentate, apex acute, base truncate or broadly obtuse, petiolate, the uppermost excepted, these sessile, pubescent on both sides; petioles broadly winged, connate, widest at or near the stem, entire or minutely serrate, usually a little shorter than the blades; inflorescences in axils of upper leaves, cymose-dichasia, the lax pedicels ca. 23-33 mm. long, on peduncles up to 15 cm. long, usually exceeding 10 cm.; sepals ovate, 10-12 mm. long, acute or frequently acuminate, margins distantly or less often closely serrate, the teeth black, spinose, calyx tube very short, ca. 1 mm., calyx externally pubescent; corolla wholly glabrous, small for the genus, upper and lower lips subequal, ca. 7-8 mm. long and wide, the hooded upper lip completely covering the brown, divaricate, oblate anthers whose filaments do not exceed 1 mm. long; style ca. 2.5-3.5 mm. long, exceeding the stamens, ovary pubescent with short, erect hairs, ovoid or hemispherical, shorter than the style; capsule 2-3 mm. long, sub-hemispherical or broadly ovoid, tapering to apex, densely pubescent, loosely invested by the sepals.

Amazonas: Mountain south of Tambo de Ventilla, thin loam over clay banks alt. 2700-2900 m., Pennell 15791, (PH, type; F; NY). The only collection known.

Close to Calceolaria connatifolia Pennel from which it differs in having mostly petiolate leaves, serrate sepals and glabrous corolla with subequal lip as well as in the general presence of pubescence and shape of the anthers.

CALCEOLARIA SUBSCAPOSA Edwin, sp. nov.

Herba annua erecta, caules glabri, usque ad 3-jugis laminarum et interdum paudiramosi. Flores plerumque 2, ad apicem, pedicellata rare in cymosis 3-floribus disposita; internodiâ longior quam lamina; lamina longipetiolata, ovata dentata usque ad 2-jugis lobarium; calyx et corolla glabra excepte labium inferum proxime glandulosa; loculi antherarum omnino fertili subapproximati, connectivum excedenti; capsula abrupte angustata ad apicem.

Erect, annual herb, up to 20 cm. tall, stem with up to 3 pairs of leaves and unbranched or occasionally once-branched, rarely twice-branched, apically usually bearing 2 flowers when unbranched, or each apex 2-flowered when branched, rarely with a 3-flowered cyme at the apex, stems glabrous, internodes several times longer than the small leaves. Leaves petiolate, blades ovate in outline, up to about 1.0 cm. long and 0.8 cm. wide, usually sparsely puberulent above, thinly pulverulent beneath, margins dentate to with 2 pair of dentate-denticulate lobes; petioles up to about half as long as the blade especially on the lowermost pair of leaves, decreasing in size to the apex of the stem, puberulent; pedicels mixed glandular and eglandular pubescent, mostly 3.5-5.5 cm. long; bracteoles occasionally developed near the base of the flower-stalk; sepals glabrous, broadly ovate, acute, 4.5-5.0 mm. long and 3.8-4.2 mm. wide, margins entire, a little thickened; corolla yellow, 9-11 mm. long; upper lip glabrous, ca. 4 mm. long, lower lip not twice as long as the upper, sparsely red-gland-dotted proximally on the upper part of the sac that is about three-fourth the length of the ca. 7 mm. long lip; both anther cells fertile, both larger than the very short, thin connective; style ca. 1.5 mm. long; capsule from as long as to more often longer than the calyx, ovoid, basally ca. 4.5 mm. wide, abruptly narrowing to a neck about one-third the length of capsule, sparsely gland-tipped-pubescent, glands soon fugitive.

Known only from the copious type specimen.

Lima: Along Rio Chillón, above Obrajillo, open rocky banks alt. 2800-3200 m. Pennell 14410 (PH).

No other taxon in this subgenus has the following combination of characters; subscapose stem, almost wholly pedicellate flowers, lower corolla lip less than twice as long as the upper and anther cells both fertile and separated by a very short connective.

CALCEOLARIA TRILOBA Edwin, sp. nov.

Frutex lignis juvenalis dense tomentosis; lamina subcoriacea, margines revoluta lateraliter biloba ad basim; flores solitariae vel in 3-flores dichasiam, exillariae vel terminaliae, calycis lobi intus pilosi vel glanduloso-puberulenti, glandulae nitidae rubrae, corolla extus glabra vel glandulosa, glandulae rubrae, vel papillosa, labium subtum saccatum plus quam medio.

Climbing or erect shrub, wood densely tomentose when young, vesture decreasing with age, densely foliaceous on distant or close branches. Leaves subcoriaceous, broadly ovate in outline, less than 1 cm. long and wide, pilose above, densely lanate

beneath, the vesture obscuring the tissue, margins little to very thickly revolute, with one pair of broad, basal, lateral lobes, these either divergent or somewhat antrorse, when divergent base of blade truncate, when antrorse base broadly ovate; costa and few secondary veins very deeply impressed above; flowers solitary or in 3-flowered dichasia, axillary in the upper parts of branches or terminal on the stem; flower stalks up to 2 cm. long, mostly shorter, less than 1 cm. long, densely tomentose; calyx externally pilose or puberulent, internally pilose or glandular-puberulent, glands shining red, elliptic to ovate, 4-5 mm. long and 2-4 mm. wide, acute; corolla yellow, often with 1 or 2 purple bands, externally glabrous or red-glandular and papillose, internally with a tuft of white hair at the base of the lower lip; upper lip minute; lower lip 14-18 mm. long, saccate more than half its length, sac abruptly flaring, flobose, upturned; anther cells divaricate, equal, each pair 2-3 mm. long, more or less than twice as long as wide, filaments shorter than the style; style thickened 2-3 mm. long, apically curved; capsule unknown.

Ancash: Polylepis thicket, alt. 3500-3700 m., mountain E. of Copa Grande, N. of Chancos, Pennell 15317 (PH, type; PH; US;). -- Libertad: open jalca above Motil, alt. 3200 m., Pennell & Ferreyra 14848.

Two varieties the typical and one other might well be established for this taxon based on corolla vesture, amount of recurving of leaf margins and calyx lobe shape. But in view of the scanty material the taxon is provisionally treated as composed of only one variety.

This taxon is close to C. inaudita Kranzl., which differs in having almost equal corolla lips, only barely lobed leaves reinform anther cells.

CALCEOLARIA VARIEFOLIA Edwin, sp. nov.

Frutex lignia adpressis puberulis; inflorescentiis 3-floribus dichasiis; calycis-lobis ovatis, obtusis, 4-5 mm. longis; corollis 16-18 mm. longis, labio superno 1-2 mm. longo, infero glabro, saccato minus quam medico; filamentis incrassatis aequaliter basim ad apicem, loculis antherarum aequalibus vel inaequalibus; stylis ca. 2 mm. longis; ovariis dense rubropunctis obtectis.

Divergently branching shrub, wood and flower stalks appressed-puberulent, branches opposite, distant, main stem aphyllous or almost so. Leaves ovate, sometimes very broadly ovate, 2.5-6.0 cm. long and 0.8-4.0 cm. wide, usually 4-5 cm. long, acute at apex, obtuse to almost acute at base, margin subentire to subdistantly serrulate-serrate, puberulent above, red-punctate

beneath, punctations a little impressed or on the surface, very short petiolate to subsessile; petioles 0.3-2.0 mm. long, thickened; inflorescences 3-flowered dichasia in the axils of the upper pairs of leaves; flower stalks up to 1.5 cm. long, usually a little shorter; calyx lobes pubescent on both surfaces, especially on and near the margins, ovate, 4-5 mm. long and ca. 3.0-3.5 mm. wide, obtuse; corolla yellow, glabrous, ca. 16-18 mm. long, upper lip reduced to a ring, ca. 1.0-1.5 mm. long, lower lip saccate less than half its length; filaments short, equally thickened base to apex, anther cells less than twice as long as wide, equal or a little unequal; style ca. 2 mm. long; ovary densely red-glandular; capsule unknown. Only the type collection thus far seen.

Piura: Rocky bank above Canchaqui, alt. 1700-1900 m.,
Pennell & Ferreyra 14916, (US, type; PG).

Differs from Calceolaria boliviana (Britton ex. Rusby) Pennell in having much smaller flowers with ovate calyx lobes as opposed to lanceolate lobes and short style, ca. 2 mm. long as opposed to 6-8 mm. and finally the vestiture and branching habit differ.

CALCEOLARIA VELUTINOIDES Edwin, sp. nov.

Vena foliorum densissime infra lanosotomentosa, folia usque ad 2 cm. longa et 1.0-1.2 cm. lata, plerumque parviora; calycis lobi extus pilosi et rubropunctati, intus pubescenti in marginibus; corolla glabra, 8-12 mm. longa, labium inferium fere latum quam longum; loculi antherarum plerumque duplo vel triplo longior quam latior.

Erect, branched shrub, wood, except the main stem and flower stalks, densely lanose-tomentose, main stem glabrate, wood usually drying light brown. Leaves short-petiolate, densely matted-pilose-tomentose above and on the veins beneath, orange-red punctulate beneath and sometimes sparsely so above, ovate, usually not exceeding 2.0 cm. long and most often 1.0-1.2 cm. wide, a few longer and occasionally narrower, margins a little thickened, crenulate to entire, apex acute, base sub-obtuse; flower stalks mostly not exceeding 1.3 mm. long; inflorescences corymbose-dichasia, usually once branched, few-flowered, terminal or axillary in upper leaves; calyx lobes externally pilose and red-punctulate, internally with a row of white hairs along the margins and at the acute to short-acuminate apex, ovate, ca. 6 mm. long and 4 mm. wide; corolla yellow, glabrous, 8-12 mm. long, upper lip reduced to a narrow ring, lower saccate less than half its length, almost as wide as long; filaments less than 2 mm. long, anther cells equal, divergent, usually 2-3 or more times longer than wide, occasionally only ca. 1.8 times; style ca. 2 mm. long, little if at all thickened; ovary glabrous to glandular-pustulate; capsule not seen.

Amazonas: Cerro Puma-urcu, SE of Chachapoyás, shrub on and near rocks, alt. 3100-3200 m., Pennell 155555, (US, type; PG); Cerro Puma-urcu, SE of Chachapoyas, rocks near base of cliff, alt. 3300-3400 m., Pennell 15695.

Close to C. croceopunctata and C. rugulosa Edwin, differing from the former in inflorescence structure, style length and in lacking an acumin at the apex of the septum separating the anther locules and from the latter in having much smaller leaves and shorter petioles, simpler inflorescences, and also glabrous corolla with longer sac.

CASTILLEJA BRACTEATA Edwin, sp. nov.

Herba perennis caespitosa, bracteis divisiss ex medio in 3 segmentis lanceolatis eis divisiss in lobis binatis; calyce inaequaliter fissio antico quam postico profundiore, genitalia inclusa in galeam, stigmatiss lobi connati, capsula ovoidea vel oblonga ad apice obliqua acuminata.

Densely matted, dwarf, perennial herb, up to 5 cm. tall, from a knob-like rootstock. Stems obscured by the leaves that are longer than the inter-nodes, puberulent and angled; leaves narrowly lance-ovate or -oblong, minute to about 1.5 cm. long, usually with 1 or a pair or 2-pair of short, linear or narrowly lanceolate lobes mostly from the upper part of the blade, occasionally entire, viscid, puberulent-ciliate on the margins, sessile, acute, little or sometimes not at all narrowed to base; inflorescences short, dense spikes; bracts 11-14 mm. long, margins ciliolate, broadly ovate in outline, divided from about the middle into 3 divisions, the lateral divisions usually dividing once again, the median once or twice, lobes lanceolate, acute, decreasing in length from primary to secondary and tertiary, drying green (red-tipped?); flowers (and fruits) sessile; calyx red-tipped or green, broadest at the apex, regularly, slightly tapering to the base, subcylindric or subsalverform, 13-18 mm. long, puberulent on the main veins and tissue above on both surfaces, ciliolate-puberulent on the margins, lobes obtuse, median cleavages very unequal, about one-fourth the length of the calyx (above) posteriorly and one-half way (below) anteriorly, lateral cleavages lacking or the lobes merely reflex or emarginate; corolla 15-24 (-26) mm. long, exceeding the calyx, at least part of the galea exerted, usually up to one-half its length, galea densely puberulent externally, often red-reen; 6-10 mm. long, margin thickened, inrolled, lip very short, included in the calyx, the 3 lobes lanceolate, hardened, infolded, sac moderately developed; stamens didynamous, pairs almost equal in length, the longer pair 1-2 mm. shorter than the galea, included; style and stigma about reaching the longer stamens, stigma lobes capitate-punctiform, wholly united;

capsule narrowly ovoid or oblong, 12-14 mm. long, oblique near the acuminate apex; seeds numerous. loosely enveloped by the reticulate testa, reticulations dark.

Cuzco: Prov. Calca, Pisac, prados humedos, alt. 3400 m., April 1943, Marin 252 (F).

This well marked species, especially as to habit of plant and the lobing of the bracts is also technically unique not fitting into any section of the genus thus far described.

CASTILLEJA CERROANA Edwin, sp. nov.

Calycis lobi lateralis fissi 1.5-2.5 mm., lobulis subaequaliter deltoideis vel ovatis acutis; calycis tubus fissus aequaliter vel subaequaliter medianus et tubus et lobi dense pubescenti, pubis laxis; corollae labia exserta, labium anteriorum plus quam galeam one-half longam, saccata non indurate; stylus et stamina breviores quam galeam, stylus longior ad brevior quam stamina, stigmatibus lobi indivisi, capitata-punctiformi.

Erect, pubescent, little branching, perennial herb, 40 cm. tall. Stem densely pubescent, hair soft and a little curly, neither twisted nor matted; leaves pubescent on both surfaces, lanceolate, narrowly oblong or linear, up to 3 or 4 cm. long; usually with a pair of short, linear lobes from above the middle, entire, acute, narrowed to the base, sessile; inflorescences spikes up to almost one-half the length of the stem, terminal on the main stem and appressed branchlets; flowers dense when young, less so at maturity; bracts densely pubescent on both surfaces, linear- or narrowly oblanceolate in outline, sessile, with usually 2-pair of linear, acute lobes, the longer pair, from below the middle always developed the shorter subapical pair sometimes wanting; flowers on very short, ca. 0.5-1.0 mm. pedicels; calyx 17-19 mm. long, densely long-lax pubescent without, shorter pubescent within, tube cleft equally, or subequally medianly to below the middle, lateral cleavages 1.5-2.5 mm. long, the lobes subequal in size and shape, deltoid or ovate, acute; corolla 20-22 mm. long, lips exserted, lower lip ca. 6 mm. long, saccate, not indurate, pale yellow, lobes linear, acute, erect, galea 9-10 mm. long, carmine-red, densely stiff, golden, pubescent externally, margins inrolled, thickened; stamen pairs very unequal in length, the upper a little shorter than and included in the galea; -tyle longer or shorter than the stamens, included, stigma lobes united, punctiform; capsule narrowly ovoid, 14-16 mm. long, suboblique near the short-acuminate apex; seeds numerous, narrowly ovoid, the loose testa dark-reticulate.

Ancash: Cordilera Blanca, alt. 4400 m., Rauh-Hirsch P2096 (F).

This taxon is close to Castilleja pseudopalescens Edwin, differing in the lateral cleavage of the calyx, the calyx lobe size and shape, general pubescence and in the lobing of the bracts.

The collection is from the highest altitude so far recorded for the genus.

CASTILLEJA PSEUDOPALLESSENS Edwin, sp. nov.

Calycis lobi lateraliter fissi 3-5 mm. lobulis lanceo-attenuatis tubus fissus subaequaliter medianus; corollae labia exserta labium anteriorum plus quam one-half galeam longam, saccata non indurata; stylus et stamina 2-3 mm. breviores quam galeam stigmatidis lobi connati capitata-punctiformi.

Erect herb up to 22 cm. tall, stem puberulent-pubescent, foliage puberulent-ciliate, stem alternate branching from near the base, drying yellow-to-purple-brown, subshining, internodes 2-3 cm. long, at least on lower half of the stem; leaves lanceolate, narrowly oblong or linear, usually with 1-pair or 2-pairs of long or short, linear lobes, from minute to about 3 cm. long, most often 1.0-2.5 cm. long, lobes and blades acute, blades sessile, sometimes clasping; inflorescences lax or dense spikes; bracts a little wider than the leaves, with 2 or more often 3 pairs of linear lobes, the pair nearest the base longest, the pair at the apex shortest; flowers sessile, red-tinged; calyx 18-21 mm. long, cleft subequally medianly, tube puberulent or subglabrous, veins and lobe margins ciliate-ciliolate, lobes lanceolate, attenuate, laterally cleft 3-5 mm.; corolla well exserted, 25-28 mm. long, lip ca. 6 mm. long, little more than half as long as the galea, a little saccate, the 3 lobes linear or narrowly lanceolate, obtuse, galea dorsally pubescent, red or purple, 10-11 mm. long; stamen pairs only little unequal in length, the longer 2-3 mm. shorter than the galea; stigma lobes wholly united, capitate-punctiform, reaching the longer pair of stamens; young capsules narrowly ovoid, ca. 15 mm. long and 6-7 mm. wide, oblique near the acuminate apex; seeds linear to narrowly ovoid, the loose testa darkly reticulate.

Apurimas: Prov. Grau, cuestra Quellipata, stony slopes at alt. 2700 m., March 9, 1946 Vargas 5800 (F).

This taxon is related to the species of the section Pallescentes of Western North America and may be placed therein.

CALCEOLARIA VIRGATA f. LLAMAENSIS Edwin, f. nov.

Herba vel frutex, differt a typica laminis pubescentiis infra solis in venis; calycem lobis 7-10 mm. longis; stylis 3-4 mm. longis; petiolis brevissimis, vix 1 mm. longis.

Herb or shrub differing from the typical form in the following ways: leaf blades pubescent beneath on the veins only; calyx lobes 7-10 mm. long; style 3-4 mm. long; petioles very short, hardly 1 mm. long.

Cajamarca: Herb, open bank, below Llama, alt. 1850 m., Pennell 15914 (PH, type; US); Shrub, banks and rocks, Llama, alt. 1900-2400 m., Pennell 15919.

CASTILLEJA VIRGAYOIDES Edwin, n. sp.

Calycis lobi lateraliter integri tubus fissus inaequaliter medianus; corollae labia exserta, labium anteriorum brevissimum non saccatus, galea quam labium ca. 5x longior; stylus et stamina galeam equitans, stigmatus lobi indivisi clavati; capsula obliqua ca. 14-15 mm. longa.

Erect, clumping, perennial herb up to 25 cm. tall. Stems pubescent in the inflorescence and either puberulent below or becoming glabrate near the base or entirely glabrous and shining brown; leaves linear or lanceolate, pubescent or puberulent on one or both sides, up to 3 cm. long, usually with 2 or 3 leaflets in the axil, entire, usually with a pair of short, linear lobes, narrowed to an acute apex, sessile; inflorescence a spike or spicate in flower, racemose in fruit, often interrupted below; bracts with 1- or 2-pairs of lobes, little wider than the leaves, distally red (in vivo); flowers on short, ca. 1-2 mm. long, pubescent pedicels; calyx tubular, 15-17 mm. long, pubescent on both surfaces, obtusely rounded apically, medianly cleft very unequally, posteriorly only 2-3 mm., anteriorly beyond the middle, ca. 10-12 mm., lateral cleavages lacking; corolla about 20-24 mm. long, galea yellow-green (in vivo), about 10-11 mm. long, exserted, pubescent externally; lip rudimentary, ca. 1.5-2.5 mm. long, little if at all inflated, the lobes linear, the median shorter than the lateral; stamens included, pairs only a little unequal in length, anthers linear; stigma and style reaching to about the longer stamens, stigma lobes united, clavate; capsule drying black, glabrous, oblique near the short-apiculate apex, borne on pedicels up to 8 mm. long, placenta medianly thickened, septum early deciduous; seeds numerous, ovoid, the reticulate testa loose.

Cuzco: Prov. Cuzco, open rocky hill on trail to Pisac at alt. 3500-3600 m., April 28-30, 1925, Pennell 13699 (F, type: GH; NY:

PH). Apimac: Salcantay, 4300 m. alt., Rauh-Hirsch P. 1398. -- Ayacucho: La Quinau, grassy banks, alt. ca. 12,000 ft., Macbride & Featherstone 2002. -- Cuzco: Cordillera Veronica, alt. 3300-3500 m., Rauh-Hirsch P964. -- Huancayo: Huayta-pallana, alt. 4600 m., Rauh-Hirsch P1718. -- Junin: Mount La Juntay, near Huancayo, about alt. 4700 m., Killip & Smith 22085. -- Lima: Canta, mountains above Canta, Pennell 14429; East of Canta, alt. 4000-4200 m., Pennell 14686. -- Sin. Depto.: Viso, shrubby slope, alt. ca. 9000 ft., Macbride & Featherstone 581; Sin. Loc.: Diehl 2563.

This species is closely related to C. Virgata Dombey ex Wedd. from which it differs in having smaller flowers and fruits, shorter stigma and style in relation to the stamens and galea and in the shorter calyx in relation to the corolla. Further the calyx lobes of C. virgata are laterally secondarily retuse and the (lower) lip of the corolla is clearly saccate. Both C. virgata and virgatoides are closely allied to species of the western United States that are now placed in the section Linariaefoliae. However, the Peruvian taxa differ sufficiently to warrant separate sectional status.

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1. Bentham, G.

1846. In A. de Candolle, *Prodromus* 10: 186-586 (passim).

2. Kränzlin, Fr.

1907. In Engler, *Pflanzenreich* IV, 257C: 1-122.

ADDITIONAL NOTES ON THE ERIOCAULACEAE. XXVIII

Harold N. Moldenke

ERIOCAULACEAE Lindl.

Additional bibliography: Körn. in Miq., Prol. Fl. Iap. 326--328. 1867; Erdtman, Handb. Palyn. 102, 268, 269, & 477, pl. 28 (6). 1969; Kapp, How to Know Pollen 92 & 236, fig. 182. 1969; Moldenke, Phytologia 19: 320--351. 1970.

Erdtman (1969) says "This family, which belongs to the monocotyledons, has spirotrema pollen grains, i.e., the exine consists of one or more spiral pieces, held together by one or several, thin, leptoma- or colpus-like bands (membranes). Pollen grains of somewhat similar type occur, inter alia, in the west-Mediterranean liliaceous genus Aphyllanthes."

BLASTOCAULON RUPESTRE (Gardn.) Ruhl.

Additional synonymy: Paepalanthus rupestris Gardn. in Hook. f., Icon. Pl. 6 [new ser., 2]: pl. 525. 1843. Philodice rupestris Benth. & Hook. f. apud Ruhl. in Engl., Pflanzenreich 13 (4-30): 223 & 292, in syn. 1903. Syngonanthus rupestris (Gardn.) Ruhl. ex Moldenke, Known Geogr. Distrib. Erioc. 59, in syn. 1946.

Additional bibliography: Moldenke, Phytologia 19: 322. 1970.

Bentham & Hooker (1883) do not actually make the combination in Philodice cited to them by Ruhland (1903). For their exact statement about this plant see under B. albidum in this series of notes.

ERIOCAULON Gron.

Additional synonymy: Euriocaulon C. Wright ex Sauv., Fl. Cub. 163, sphalm. 1871. Eriaucaulon Nees ex Usteri, Beitr. Kenntn. Philip. Veg. 131, sphalm. 1905.

Additional & emended bibliography: R. Br., Prodr. Fl. Nov. Holl., pr. 1, 1: 252--255 (1810) and pr. 2, [Isis 1819:] 47--48. 1819; Guill. in Deless., Icon. Pl. Sel. 3: 57--61 & 67, pl. 95--98. 1837; Benth. in Hook. f., Niger Fl. 547--548 & 582. 1849; Schweinf., Beitr. Fl. Aethiop. 295 & 309. 1867; Körn. in Miq., Prol. Fl. Iap. 326--328. 1867; Miq., Cat. Mus. Lugd. Bat. 108--109 & 146. 1870; Sauv., Fl. Cub. 161--163. 1871; Sauv., Anal. Acad. Ci. Habana 7: 715--717 (1871) and 8: 48--50. 1871; Hance, Journ. Bot. 16: 14. 1878; Benth. & Hook. f., Gen. Pl. 3 (2): 1020--1024, 1239, 1244, 1245, 1252, 1254, & 1255. 1883; Kuntze, Rev. Gen. Pl. 2: 745 & 746. 1891; Maxim., Diagn. Pl. Nov. Asiat. 8: 1--28. 1893; Ruhl. in Engl., Bot. Jahrb. 27: [65]--85. 1899; N. L. Britton, Man., pr. 1, 236--237, 1067, & 1078 (1901), pr. 2, 236--237, 1067, & 1078 (1902), and pr. 3, 236--237, 1067, & 1078. 1905; Usteri, Beitr. Kenntn. Philip. Veg. 131. 1905; N. L. Brit-

ton, Man., pr. 4, 236--237, 1067, & 1078. 1907; H. Lecomte, Journ. de Bot. 21 [ser. 2, 1]: 86--94, [101]--109, & [129]--136, fig. 1-3. 1908; Britton & Br., Illustr. Fl., ed. 2, pr. 1, 1: 453--456, [678], & 679, fig. 1140--1144 (1913) and 3: 575 & 625. 1913; H. N. Ridl., Fl. Mal. Penins. 5: 133--136, fig. 218. 1925; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 39--46, 48--50, 697, 698, 700, 701, 703, & 704. 1930; Britton & Br., Illustr. Fl., ed. 2, pr. 2, 1: 453--456, [678], & 679, fig. 1140--1144 (1936) and 3: 575 & 625. 1936; Moldenke in Lundell, Fl. Texas 3, pr. 1, 3--9. 1942; Britton & Br., Illustr. Fl., ed. 2, pr. 3, 1: 453--456, [678], & 679, fig. 1140--1144 (1943) and 3: 575 & 625. 1943; Moldenke, Alph. List Cit. 1: 3, 4, 6--8, 10--13, 15--19, 21, 23--25, 27--38, 40--43, 45, 46, 49, 55--57, 59--61, 63, 64, 71, 74, 79, 80, 82, 88--92, 94, 98, 99, 103, 104, 106, 107, 109, 111--113, 115--118, 120, 122--125, 128--130, 132, 137--140, 142, 143, 148, 149, 151--153, 160, 163--166, 169, 170, 174--178, 182, 186--188, 192--195, 197, 199, 200, 204--206, 209, 211--214, 220, 223--226, 229, 231, 234, 235, 239, 240, 242, 244, 245, 247--250, 253, 255, 257, 258, 261, 262, 268--271, 276--285, 287, 288, 290--296, 314, 321, 324, & 326. 1946; Britton & Br., Illustr. Fl., ed. 2, pr. 4, 1: 453--456, [678], & 679, fig. 1140--1144 (1947) and 3: 575 & 625. 1947; Moldenke, Alph. List Cit. 2: 333, 334, 351, 352, 358, 361, 365, 370, 389, 404--406, 409, 412, 413, 424, 429, 449, 453--457, 459--462, 473, 475--481, 490--494, 496, 506, 507, 511--514, 524, 526, 529, 530, 533, 536, 538--540, 543, 545, 548, 549, 554, 555, 558, 559, 568--570, 572, 576, 580, 581, 583, 585, 587, 588, 598, 604, 609, 610, 614, 617, 618, 625--627, 630--632, 634, 635, 638, 639, 641--643, 648, 650, & 651 (1948), 3: 656, 659, 660, 664, 668, 669, 671, 676, 697--702, 706, 707, 709, 713, 715, 718--722, 727, 728, 731, 732, 736, 738--745, 747, 749, 750, 752--756, 759, 760, 768, 771--778, 783--785, 788--790, 794, 800, 803, 805--807, 811--813, 815, 821--824, 827--832, 835, 840--843, 848--852, 855--859, 869--872, 876--880, 884, 890--892, 894, 898--900, 911, 916, 918, 925--927, 929--932, 936, 937, 939, 941--946, 948, 957--959, 961, 962, 964, 969, 971--973, & 975--977 (1949), and 4: 985--993, 997, 998, 1001--1004, 1011, 1012, 1014--1016, 1048, 1072, 1074--1079, 1081, 1084--1086, 1094, 1095, 1097--1099, 1102, 1105, 1107, 1111--1115, 1117--1119, 1121, 1123, 1125, 1127--1129, 1132--1138, 1140, 1141, 1143--1145, 1148, 1151, 1155, 1158, 1162, 1167--1171, 1173, 1175--1181, 1188, 1189, 1191, 1192, 1197--1206, 1209--1212, 1214, 1216--1218, 1220--1223, 1225--1227, 1229, 1231, 1232, 1235, 1237--1241, 1243, 1244, 1246, 1247, 1251, 1252, 1255, 1259--1261, 1277, 1288, 1289, 1291--1294, 1296, 1297, 1301, 1302, & 1304. 1949; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 115--204 & 263--271. 1955; F. Herman, Fl. Nord & Mitteleur. 215--216. 1956; Hedberg, Symb. Bot. Upsal. 15 (1): 60--61 & 263. 1957; Van Royen, Nov. Guin., new ser., 10: [21]--44, fig. 1--5 (1959) and 10: 236. 1960; G. S. Puri, Indian For. Ecol. 1: 293. 1960; Moldenke in Lundell, Fl. Texas 3, pr. 2, 3--9, 415, & 425. 1961; J. D. Montgomery, N. J. Nat. News 18: 122. 1963; Sandoval, Biol. Abstr. 46: 2128. 1965; Van Royen, Nov. Guin. Bot. 14: 467. 1965; Datta & Majumdar, Bull. Bot. Soc. Bengal 20: 38--39. 1966; Kral,

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ERIOCAULON HONDOENSE Satake

Additional bibliography: Moldenke, Phytologia 19: 338. 1970.

Additional citations: WESTERN PACIFIC ISLANDS: JAPAN: Honshu: Ohwi & Koyama 1124 (N).

ERIOCAULON MONTANUM Van Royen

Additional bibliography: Moldenke, Phytologia 19: 65, 81, 84, 95, & 96. 1969.

Brass describes this species as "common in close masses on alpine seepage slopes" at 3680 meters altitude.

ERIOCAULON NEO-CALEDONICUM Schlecht.

Additional bibliography: Moldenke, Phytologia 19: 83 & 93. 1969; Erdtman, Handb. Palyn. 268 & 269, pl. 28 (6). 1969.

Illustrations: Erdtman, Handb. Palyn. 269, pl. 28 (6). 1969.

ERIOCAULON PELLUCIDUM Michx.

Additional bibliography: Kapp, How to Know Pollen 92 & 236, fig. 182. 1969; Moldenke, Phytologia 19: 350—351. 1970.

Additional illustrations: Kapp, How to Know Pollen 92, fig. 182. 1969.

The M. I. Moore s.n. [Deep River, August 23, 1963] cited in a previous installment of these notes as from "County undetermined" is actually from Renfrew County, Ontario.

ERIOCAULON PINARENSE Ruhl.

Additional bibliography: Moldenke, Alph. List Cit. 1: 64 & 188. 1946; Moldenke, Phytologia 18: 392—393. 1969.

ERIOCAULON PLUMALE subsp. KINDIAE (H. Lecomte) Meikle

Additional & emended bibliography: H. Lecomte, Bull. Bot. Soc. France 55: 646 & 647. 1909; Moldenke, Phytologia 19: 88. 1969.

ERIOCAULON PRINGLEI S. Wats.

Additional bibliography: Moldenke, Alph. List Cit. 2: 461 (1948) and 3: 829 & 832. 1949; Moldenke, Phytologia 18: 424. 1969.

ERIOCAULON PSEUDOQUINQUANGULARE Ruhl.

Additional synonymy: Eriocaulon pseude-quinquangulare Ruhl. apud Fyson, Journ. Indian Bot. 2: 320, sphalm. 1921.

Additional bibliography: Fyson, Journ. Indian Bot. 2: 320. 1921; Moldenke, Phytologia 18: 424—425. 1969; M. A. Rau, Bull. Bot. Surv. India 10, Suppl. 2: 84. 1969.

ERIOCAULON PULCHELLUM Körn.

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 72 & 84. 1899; Moldenke, Phytologia 19: 88. 1969.

The Barter 778, distributed as E. pulchellum, is actually the type collection of E. togoënsense Moldenke.

ERIOCAULON PULVINATUM Van Royen

Additional bibliography: Moldenke, Phytologia 19: 88. 1969.

Although Van Royen (1959) cites the type of this species as "Brass 9997 in Herb. Lugd. Bat.", the collections seems to be cited more accurately as Brass & Meyer-Drees 9997, as is indicated by the label on the Britton Herbarium specimen. These collectors found the plant "massed in alpine bog turf". The species was confused by me previously with E. brevipedunculatum Merr.

Citations: MELANESTIA: NEW GUINEA: Dutch New Guinea: Brass 9231 (N), 9282 (N); Brass & Meyer-Drees 9997 (N—isotype).

ERIOCAULON PUSILLUM R. Br.

Additional & emended bibliography: R. Br., Prodr. Fl. Nov. Holl., pr. 1, 1: 254—255 (1810) and pr. 2, [Isis 1819:] 48. 1819; Moldenke, Phytologia 18: 427—428. 1969.

ERIOCAULON PYGMAEUM Soland.

Additional & emended bibliography: R. Br., Prodr. Fl. Nov. Holl., pr. 1, 1: 254 (1810) and pr. 2, [Isis 1819:] 48. 1819; Moldenke, Phytologia 19: 88—89. 1969.

ERIOCAULON QUINQUANGULARE L.

Additional synonymy: Eriocaulon quinquangulare var. argenteum (Mart.) Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 1, 341. 1864. Eriocaulon quinquangulare vera Fyson, Journ. Indian Bot. 2: 204. 1921.

Additional bibliography: Kuntze, Rev. Gen. Pl. 2: 746. 1891; Ruhl. in Engl., Bot. Jahrb. 27: 85. 1899; Moldenke, Alph. List Cit. 2: 461 (1948), 3: 879 (1949), and 4: 1128. 1949; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 2, 341. 1964; Datta & Majumdar, Bull. Bot. Soc. Bengal 20: 39. 1966; Rao & Kumari, Bull. Bot. Surv. India 9: 110. 1967; Sebastine & Vivekanathan, Bull. Bot. Surv. India 9: 183. 1967; Sebastine & Ellis, Bull. Bot. Surv. India 9: 199. 1967; Vajravelu, Joseph, & Chandr., Bull. Bot. Surv. India 10: 81. 1968; J. L. Ellis, Bull. Bot. Surv. India 10: 159. 1968; M. A. Rau, Bull. Bot. Surv. India 10, Suppl. 2: 84. 1969; Moldenke, Phytologia 19: 70 & 89--90 (1969) and 19: 234, 236, 237, 243--246, & 343. 1970.

Vajravelu & his associates (1968) cite J. Joseph 17861 from Kerala, India, as representing this species, while Ellis (1968) cites nos. 16859 & 22129 from Andhra Pradesh. Rao & Kumari (1967) cite no. 22490 from Andhra Pradesh, Sebastine & Ellis (1967) cite Ellis 11765 from Madras, and Sebastine & Vivekanathan (1967) cite their no. 17486.

ERIOCAULON RAVENELII Chapm.

Additional & emended synonymy: Eriocaulon ravenelli Chapm. ex Moldenke, Phytologia 3: 342, in syn. 1950. Eriocaulon ravenellii Chapm. ex Moldenke, Phytologia 3: 342, in syn. 1950. Eriocaulon ravinellii Chapm. ex Moldenke, Phytologia 3: 342, in syn. 1950. Eriocaulon revenellii Chapm., in herb.

Additional bibliography: Moldenke, Alph. List Cit. 1: 25, 176, & 295 (1946), 2: 459--461, 507, & 512 (1948), 3: 842, 942--944, & 946 (1949), and 4: 1118, 1192, & 1296. 1949; Moldenke, Phytologia 18: 436--437. 1969.

Tomlinson found this plant growing in wet marl in sawgrass marshes, flowering and fruiting in November. The Diener 180, distributed as E. ravenellii, is actually Lachnocaulon anceps (Walt.) Morong.

Additional citations: FLORIDA: Collier Co.: Tomlinson 27-11-62 A (Ft--286). Monroe Co.: Tomlinson 27-11-62 B (Ft--287, Ft--287, Ft--287).

ERIOCAULON REDACTUM Ruhl.

Additional bibliography: Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 50. 1930; Moldenke, Phytologia 18: 438 (1969) and 19: 246. 1970.

ERIOCAULON REGNELLII Moldenke

Additional bibliography: Moldenke, Phytologia 18: 438. 1969.

Additional citations: BRAZIL: Minas Gerais: Irwin, Maxwell, & Wasshausen 19687 (N).

ERIOCAULON REMOTUM H. Leconte

Additional bibliography: Moldenke, Phytologia 18: 438--439 (1969) and 19: 35. 1969.

ERIOCAULON RICHARDI Körn.

Synonymy: Eriocaulon richardii Körn. apud Ruhl. in Engl., Bot. Jahrb. 27: 85, hyponym. 1899.

Bibliography: Schweinf., Beitr. Fl. Aethiop. 309. 1867; Ruhl. in Engl., Bot. Jahrb. 27: 85. 1899.

Nothing is known to me of this taxon except that it is supposed to grow in Abyssinia. A formal description has apparently never been published, and the name does not appear to be in the Index Kewensis nor any of its supplements. Ruhland (1899) was also not able to place it satisfactorily. It is listed by Schweinfurth (1867), without description, based on Schweinfurth 3971 from Abyssinia. Schweinfurth 3971 is not cited by Ruhland under either E. abyssinicum Hochst. nor E. schimperii Körn., the only species listed by him from Ethiopia in his monograph of the family (1903).

ERIOCAULON ROBINSONII Moldenke

Additional bibliography: Moldenke, Alph. List Cit. 2: 460 (1948), 3: 858 (1949), and 4: 1205. 1949; Moldenke, Phytologia 18: 439. 1969.

ERIOCAULON ROBUSTIUS (Maxim.) Mak.

Additional & emended bibliography: Maxim., Diagn. Pl. Nov. Asiat. 8: 25—27. 1893; Moldenke, Alph. List Cit. 2: 490. 1948; Moldenke, Phytologia 19: 90 (1969) and 19: 239, 244, 246, & 323. 1970.

Maximowicz (1893) distinguished his variety from typical E. alpestre by "Folia latiora (3—7 mm.) et numerosiora scapis 4—5-costatis parum breviora, capitula nonnihil majora 20—50-flora". He cites Keiske s.n., Maximowicz s.n., Ono s.n., Savatier 1361, and two collections each of Makino and of Siebold, apparently all to be regarded as cotypes.

ERIOCAULON ROBUSTO-BROWNIANUM Ruhl.

Additional bibliography: Moldenke, Phytologia 19: 90—91. 1969.

According to Fyson (1921) what is now known as E. robusto-brownianum was included by Hooker (1893) in what he regarded as E. nilagirensse Steud.

ERIOCAULON ROBUSTUM Steud.

Additional bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 66. 1899; Moldenke, Phytologia 19: 91. 1969.

ERIOCAULON ROCKIANUM Hand.-Mazz.

Additional bibliography: Moldenke, Alph. List Cit. 3: 859. 1949; Moldenke, Phytologia 18: 446—447. 1969.

ERIOCAULON SCARIOSUM R. Br.

Emended synonymy: Eriocaulon smithii R. Br., Prodr. Fl. Nov. Holl., pr. 1, 1: 254. 1810.

Additional & emended bibliography: R. Br., Prodr. Fl. Nov. Holl.,

pr. 1, 1: 254 (1810) and pr. 2, [Isis 1819:] 47. 1819; Kunth, Enum. Pl. 3: 568--571. 1841; Moldenke, Phytologia 19: 86 & 91--94. 1969.

ERIOCAULON SCHIEDEANUM Körn.

Additional bibliography: Moldenke, Alph. List Cit. 1: 31 & 314 (1946), 2: 370, 461, & 476 (1948), and 3: 829--831. 1949; Moldenke, Phytologia 19: 94--95. 1969.

ERIOCAULON SCHIMPERI Körn.

Additional & emended synonymy: Eriocaulon schimperianum Körn. apud Schweinf., Beitr. Fl. Aethiop. 309, hyponym. 1867. Eriocaulon "schimperii 'Körn.' Ruhl." apud Ruhl. in Engl., Bot. Jahrb. 27: 71, 79, & 80. 1899.

Additional & emended bibliography: Schweinf., Beitr. Fl. Aethiop. 309. 1867; Ruhl. in Engl., Bot. Jahrb. 27: 71, 79, & 80. 1899; Moldenke, Alph. List Cit. 3: 664 & 718 (1949) and 4: 1189, 1192, & 1216. 1949; Hedberg, Symb. Bot. Upsal. 15 (1): 263. 1957; Moldenke, Phytologia 19: 95--97. 1969.

Schweinfurth (1867) cites Schweinfurth 3972 from Ethiopia as representing this species. It would appear, then, that Eriocaulon richardi Körn. was regarded by him as distinct from this taxon.

ERIOCAULON SCHIMPERI var. GIGAS Moldenke

Additional bibliography: Moldenke, Alph. List Cit. 4: 1216. 1949; Moldenke, Phytologia 19: 96--97. 1969.

ERIOCAULON SCHIPPPII Standl.

Additional bibliography: Moldenke, Alph. List Cit. 1: 324. 1946; Moldenke, Phytologia 19: 97--98. 1969.

ERIOCAULON SCHLECHTERI Ruhl.

Additional & emended bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 70 & 78--79. 1899; Moldenke, Phytologia 19: 98. 1969.

ERIOCAULON SCLEROCEPHALUM Ruhl.

Additional bibliography: Moldenke, Alph. List Cit. 1: 64, 92, & 186 (1946) and 2: 648. 1948; Moldenke, Phytologia 19: 99--100 (1969) and 19: 249. 1970.

ERIOCAULON SEEMANNII Moldenke

Additional bibliography: Moldenke, Alph. List Cit. 3: 918 & 959 (1949) and 4: 1048 & 1141. 1949; Moldenke, Phytologia 19: 100--101. 1969.

ERIOCAULON SEPTANGULARE With.

Additional bibliography: N. L. Britton, Man., pr. 1, 237 (1901), pr. 2, 237 (1902), pr. 3, 237 (1905), and pr. 4, 237. 1907; Britton & Br., Illustr. Fl., ed. 2, pr. 1, 1: 454, fig. 1140 (1913) and 3: 575 & 625. 1913; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2,

15a: 39 & 49. 1930; Britton & Br., Illustr. Fl., ed. 2, pr. 2, 1: 454, fig. 1140 (1936) and 3: 575 & 625 (1936) and pr. 3, 1: 454, fig. 1140 (1943) and 3: 575 & 625. 1943; Moldenke, Alph. List Cit. 1: 4, 6, 8, 11, 15, 18, 19, 21, 29—35, 38, 40—43, 46, 56, 59, 61, 63, 71, 82, 88, 90, 91, 94, 98, 99, 104, 107, 109, 111, 112, 115, 118, 122, 123, 129, 130, 139, 142, 143, 148, 149, 152, 153, 160, 163, 169, 174, 176, 177, 182, 192—194, 197, 199, 200, 204—206, 209, 212—214, 220, 224—226, 229, 235, 239, 242, 244, 245, 247—249, 255, 257, 262, 270, 271, 276—284, 287, 288, 290, & 292—296. 1946; Britton & Br., Illustr. Fl., ed. 2, pr. 4, 1: 454, fig. 1140 (1947) and 3: 575 & 625. 1947; Moldenke, Alph. List Cit. 2: 404, 406, 412, 413, 449, 453, 455, 460, 461, 473, 476—478, 480, 481, 491—494, 496, 506, 507, 514, 524, 530, 536, 538, 555, 558, 568—570, 580, 581, 583, 585, 587, 609, 610, 614, 617, 630, 631, 634, 638, & 641 (1948), 3: 671, 679—700, 706, 707, 713, 719, 721, 722, 728, 738—740, 743—745, 750, 752—754, 760, 771—773, 783, 794, 800, 803, 806, 807, 811, 812, 823, 827, 828, 832, 842, 843, 852, 858, 870, 877, 878, 880, 890—892, 900, 911, 916, 926, 927, 931, 941, 948, 969, 971—973, 976, & 977 (1949), and 4: 986, 987, 997, 998, 1001, 1002, 1004, 1012, 1015, 1016, 1081, 1084, 1097—1099, 1111, 1112, 1118, 1119, 1121, 1123, 1125, 1127, 1135—1137, 1140, 1141, 1145, 1151, 1155, 1162, 1167—1169, 1173, 1176—1178, 1180, 1181, 1189, 1191, 1192, 1197—1199, 1203, 1204, 1209—1211, 1217, 1218, 1221—1223, 1225—1227, 1229, 1232, 1235, 1237, 1239, 1240, 1244, 1246, 1247, 1251, 1252, 1255, 1260, 1261, 1289, 1292, & 1294. 1949; Kapp, How to Know Pollen 92 & 236, fig. 182. 1969; Moldenke, Phytologia 19: 230—233. 1970.

ERIOCAULON SETACEUM L.

Additional & emended bibliography: Körn., Linnaea 27: 601. 1856; Benth., Fl. Hongk. 383. 1861; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 1, 341. 1864; Körn. in Miq., Prolus. Fl. Iap. 326. 1867; Benth. & Hook. f., Gen. Pl. 3 (2): 1021. 1883; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Maxim., Diagn. Pl. Nov. Asiat. 8: 13—14. 1893; Ruhl. in Engl., Bot. Jahrb. 27: 66. 1899; Ruhl. in Engl. & Prantl., Nat. Pflanzenfam., ed. 2, 15a: 49 & 50. 1930; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 2, 341. 1964; Tingle, Check List Hong Kong Pl. 54. 1967; M. A. Rau, Bull. Bot. Surv. India 10, Suppl. 2: 84. 1969; Moldenke, Phytologia 19: 233—237, 243, & 244. 1970.

Tingle (1967) records this species from Hongkong where, he says, it is known as the "bristle-leaved pipewort". This is most probably a case of misidentification.

ERIOCAULON SEXANGULARE L.

Additional & emended synonymy: Eriocaulon cationiense Hook. & Arn. apud Maxim., Diagn. Pl. Nov. Asiat. 8: 27, sphalm. 1893. Eriocaulon truncatum Harms ex Moldenke, Résumé 293, in syn. 1959 [not E. truncatum Buch.-Ham., 1832, nor "Buch.-Ham. ex Mart.", 1968, nor "Ham. ex Mart.", 1939, nor Mart., 1860, nor Wall., 1946, nor Wight, 1970].

Additional & emended bibliography: Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 1, 341. 1864; Schweinf., Beitr. Fl. Aethiop. 295 & 309. 1867; Körn. in Miq., Prol. Fl. Iap. 326. 1867; Miq., Cat. Mus. Lugd. Bat. 109. 1870; Maxim., Diagn. Pl. Nov. Asiat. 8: 5, 7, 10--11, 15, & 27--28. 1893; Ruhl. in Engl., Bot. Jahrb. 27: 66, 67, 72, 73, & 83. 1899; H. Lecomte, Not. Syst. 2: 215. 1912; Fyson, Journ. Indian Bot. 2: 318 & 320, pl. 39 & 40. 1921; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 49 & 50. 1930; Moldenke, Alph. List Cit. 2: 409, 460, & 461 (1946), 3: 719, 775, 879, & 957 (1949), and 4: 1129, 1176, & 1205. 1949; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 2, 341. 1964; Tingle, Check List Hong Kong Pl. 54. 1967; Moldenke, Phytologia 19: 234, 236, 238--248, 250, 325, 327, 339, & 350. 1970.

Taam found this plant "abundant on gentle slope", in sandy soil by a spring on Hongkong island. Tingle (1967) records the common name "Wallich's pipewort" for the species in Hongkong. Thwaites & Hooker (1864) regarded E. atratum Körn, as in part a synonym of E. sexangulare and in part a synonym of E. truncatum Hamilt.

The H. Hallier 1172, distributed as E. sexangulare, is in part this species and in part E. truncatum Hamilt., while Wallich 6067 is E. wightianum Mart.

Eriocaulon australe R. Br. is apparently very closely related to and may even be conspecific with E. sexangulare. The habit is almost identical and both have trimerous florets. Ruhland, however, says that in E. sexangulare "Flores partim modo trimeri, saepe \pm reducti", while in E. australe "Flores normaliter, staminibus raro abortu oligomeris exceptis, evoluti. Perigonia semper homoio [3-] mera".

Maximowicz (1893) obviously applied the name, E. sexangulare, to the plant which we now know as E. cinereum R. Br., while calling the true E. sexangulare by Martius' binomial, E. wallichianum. Under the latter name he cites "Ganditrand" [= Gaudichaud] 121 from Macao, Hance s.n. from Canton, Wright s.n. from Hongkong, Thwaites s.n. from Ceylon, Wight s.n. and others from Deccan, Stocks s.n. from Malabar, and Metz s.n. from Canara, India. He notes "Cum praecedente [E. australe R. Br.] a reliquis nostratibus floribus utriusque sexus ancipitibus (phyllis 2 alatis) distat."

Additional & emended citations: HONGKONG: Taam 1547 (N). MALAYA: Malacca: Cuming 2328 (E, Mu--345).

ERIOCAULON SIGMOIDEUM C. Wright

Additional & emended bibliography: Sauv., Anal. Acad. Ci. Habana 8: 48--49. 1871; Sauv., Fl. Cub. 163. 1871; Moldenke, Alph. List Cit. 1: 24 (1946), 2: 476 (1948), and 4: 1144 & 1304. 1949; Moldenke, Phytologia 19: 248--249. 1970.

ERIOCAULON SIKOKIANUM Maxim.

Additional & emended bibliography: Maxim., Diagn. Pl. Nov. Asiat.

8: 6--7, 16--17, & 24. 1893; Moldenke, Alph. List Cit. 2: 461 & 490 (1948) and 4: 998. 1949; Moldenke, Phytologia 19: 246 & 249--250. 1970.

Maximowicz (1893) cites the type and apparently only specimen of this species known to him as "Sikoku: principatu Tosa ad Saka-wa, Octobri '84 fl. frf. spec. 1 misit c.n. jap. 5 inunohige T. Makino". He further comments that "A proximo E. Miqueliano statim in olucro discum parum superante distinguitur".

ERIOCAULON SIKOKIANUM var. MATSUMURAE (Nakai) Satake

Additional bibliography: Moldenke, Résumé Suppl. 12: 8 & 9. 1965; Moldenke, Phytologia 19: 250. 1970.

Illustrations: Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] pl. 5, fig. 9. 1940.

The type of this variety was collected by J. Nikai (no. 1093) at Ikeda-mura, in the province of Bittyu, Honshu, Japan, in October, 1903, and is deposited in the herbarium of Tokyo University. Common names recorded for the plant are "kibi-oinunohige" and "matumura-inunohige". Satake (1940) cites Nikai 1093 and Yosino 34324 & 49462 from Honshu.

Citations: WESTERN PACIFIC ISLANDS: JAPAN: Honshu: Furuse s.n. [6 Oct. 1955] (S, S).

ERIOCAULON SILICICOLA Ridl.

Synonymy: Eriocaulon silicicolum Ridl., Journ. Fed. Malay States Mus. 6: 191. 1915.

Bibliography: H. N. Ridl., Journ. Fed. Malay States Mus. 6: 191--192. 1915; Prain, Ind. Kew. Suppl. 5, pr. 1, 97 (1921) and pr. 2, 97. 1960; Moldenke, Résumé Suppl. 17: 3. 1968.

Because of the unavailability of the original description of this species in many libraries, it may be worthwhile to reproduce it herewith: "265. Eriocaulon Hookerianum, Stapf. Eriocaulon macrophyllum, Ridl. op. cit. p. 332. Dry spots on Gunong Riam, 6,000 feet altitude, and on summit of Gunong Tahan, 7,100 feet. This exactly resembles the type-plants of Kinabalu collected by Haviland. I find the petals of the male flower very unequal, one being considerably longer than the other. In the lower-lying and damper parts of the Padang there is another plant which differs from this species in having a less distinct stem and thin long flaccid leaves, but of which the flowers bear a very close resemblance to those of E. Hookerianum, and it is possible that it is a lowland form of that species. In the previous paper I named this E. macrophyllum, Ruhl., only known from a Javan specimen collected by Warburg, but closely resembling a Javanese plant collected by Horsfield and now in the British Museum. (It is always regrettable that so many authors of the 'Pflanzenreich' volumes appear to have omitted to inspect the largest and most important herbaria of Kew and the British Museum.) I think, however, this plant is probably not the plant intended by Ruhland for his macrophyllum, and I cannot find any description to exactly suit this lowland

species. I will describe it herewith, and give it a name: — Stem very short, herbaceous, covered by the bases of the leaves. Leaves linear, flaccid, herbaceous, acute, 5 to 8 inches long, 1/8 to 1/6 inch wide, with a few sparse hairs soon disappearing. Scapes 1 to 3 in a tuft, slender, erect, 12—18 inches tall, glabrous, ribbed. Spathe at base tubular, 4 inches long, with lanceolate elongate limb. Capitulum 1/4 to nearly 1/2 inch across. Involucral bracts oblong, rounded at the tip, pubescent. Male flowers: bracts cuneate, apex rounded, pale translucent, apex thickly covered with white hairs. Perianth stalked. Sepals oblong, cuneate, tipped with white hairs and black-dotted, connate for most of their length. Corolla hardly longer; lobes 3, very unequal, one twice as long as the other two, all crested with white hairs. Stamens with pale whitish filaments; anthers rather large, black, little longer than shorter perianth-lobes. Female flower: sepals as in the male. Petals free to base, linear, with long white hairs all over. Capsule trilobed, globose. Seed oblong, obtuse at both ends. Style elongate, slender. In damp spots on the Padang. Certainly near E. macrophyllum, Ruhl., from description, but the unequal male petals are those of E. Hookerianum, and the leaves are always shorter than the culm."

The species is apparently known only from the type collection from Pahang, Malaya. The original spelling of the specific epithet was corrected by Prain (1921) because the adjective employed by Ridley is indeclinable.

ERIOCAULON SILVEIRAE Moldenke

Synonymy: Eriocaulon longepedunculatum Alv. Silv., Fl. Mont. 1: 15--16 & 398. 1928 [not E. longepedunculatum H. Lecomte, 1946, nor E. longepedunculatum H. Lecomte, 1913].

Bibliography: Alv. Silv., Fl. Mont. 1: 15--16, 398, & [I]. 1928; A. W. Hill, Ind. Kew. Suppl. 9: 105. 1938; Moldenke, Known Geogr. Distrib. Erioc. 8, 36, 40, 61, & 62. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 77 & 206. 1949; E. J. Salisb., Ind. Kew. Suppl. 11: 88. 1953; Moldenke, Résumé 89, 289, & 483. 1959; Moldenke, Phytologia 18: 270. 1969.

Silveira (1928) cites only the type collection, A. Silveira 723, from Minas Gerais, Brazil. The species is named in his honor.

ERIOCAULON SINII Ruhl.

Bibliography: Ruhl., Notizbl. Bot. Gart. Berlin 10: 1041--1042 & 1060. 1930; A. W. Hill, Ind. Kew. Suppl. 8: 87. 1933; Moldenke, Known Geogr. Distrib. Erioc. 25 & 40. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 132 & 206. 1949; Moldenke, Résumé 170 & 483. 1959; Moldenke, Résumé Suppl. 3: 18 & 19. 1962; Moldenke, Phytologia 17: 454 (1968) and 19: 72. 1969.

This species has been collected in open grassy places. The Liang 66137 cited below is a mixture with E. klusianum Maxim. Material of E. sinii has been misidentified and distributed in herbaria as E. buergerianum Körn.

Citations: CHINA: Kwangtung: Tak & Chow 2611 [Herb. Canton Chr. Coll. 14472] (Ca—319187). CHINESE COASTAL ISLANDS: Hainan: Liang 66137, in part (Go); W. T. Tsang 535 [Herb. Lingnan Univ. 16034] (N, S).

ERIOCAULON SMITINANDI Moldenke

Synonymy: Eriocaulon smitinandii Moldenke apud G. Taylor, Ind. Kew. Suppl. 13: 52. 1966.

Bibliography: Moldenke, *Phytologia* 7: 87. 1959; Moldenke, *Résumé Suppl. 1*: 13 & 25. 1959; Moldenke, *Biol. Abstr.* 35: 1688. 1960; Hocking, *Excerpt. Bot. A.4*: 592. 1962; G. Taylor, Ind. Kew. Suppl. 13: 52. 1966; Moldenke, *Résumé Suppl. 17*: 11. 1968.

This plant has been described by Smitinand as "gregarious" in wet localities in paddy fields and "very common" in wet localities of savannas, with white flowers, blooming in October and November, at 100 meters altitude.

Citations: THAILAND: Smitinand 3603 [Herb. Royal Forest Dept. 18239] (Sm), 3679 [Herb. Royal Forest Dept. 15468] (Z—type).

ERIOCAULON SOLLYANUM Royle

Synonymy: Eriocaulon trilobum Buch.-Hamilt. ex Wall., Numer. List 207, hyponym. 1832; Körn., *Linnaea* 27: 645. 1856. Eriocaulon quinquangulare Mart. ex Körn., *Linnaea* 27: 645, in syn. 1856 [not E. quinquangulare Bojer, 1964, nor Heyne, 1832, nor L., 1743, nor Wall., 1858, nor Wight, 1832]. Eriocaulon subulatum Bojer ex Körn., *Linnaea* 27: 645, in syn. 1856. Eriocaulon quinquelobum Wall. ex Hook. f., *Fl. Brit. Ind.* 6: 583, in syn. 1893. Eriocaulon trilobum Hamilt. ex Prain, *Bengal Pl.*, ed. 1, 1127. 1903. Eriocaulon solleyanum Royle ex Haines, *Bot. Bihar & Orissa* 6: 1066, in syn. 1924. Eriocaulon trilobum Körn. apud Sprague, *Kew Bull. Misc. Inf.* 1933: 385. 1933. Eriocaulon subulatum Bojer apud Moldenke, *Résumé* 293, in syn. 1959 [not E. subulatum N. E. Br., 1901]. Eriocaulon quinquangulare Willd. ex Moldenke, *Résumé Suppl. 1*: 18, in syn. 1959. Eriocaulon heterolepis & genuinum Körn. ex Moldenke, *Résumé Suppl. 1*: 17, in syn. 1959. Eriocaulon trilobus Buch.-Ham. ex Moldenke, *Résumé Suppl. 3*: 32, in syn. 1962. Eriocaulon trilobum "Buch.-Ham. ex Körn." apud Backer & Bakh., *Fl. Java* 3: 26, in syn. 1968. Eriocaulon trilobium Buch.-Ham., in herb.

Bibliography: Wall., Numer. List 207. 1832; Royle, *Illustr. Bot. Himal.* 409, pl. 97, fig. 1 a, b, d—f, & i. 1840; Körn., *Linnaea* 27: 645. 1856; C. Müll. in Walp., *Ann.* 5: 926, 937, & 940 (1860) and 6: 1171. 1861; Thwaites & Hook. f., *Enum. Pl. Zeyl.*, pr. 1, 341. 1864; Körn. in Miq., *Ann. Mus. Bot. Lugd.* 3: 163. 1867; Körn. in Miq., *Prol. Fl. Iap.* 327. 1867; Hieron. in Engl. & Prantl, *Nat. Pflanzenfam.*, ed. 1, 2 (4): 27. 1888; Kuntze, *Rev. Gen. Pl.* 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 879. 1893; Maxim., *Diagn. Pl. Nov. Asiat.* 8: 15. 1893; Hook. f., *Fl. Brit.*

Ind. 6: 583. 1893; Ruhl. in Engl., Bot. Jahrb. 27: 66, 67, 71, & 81. 1899; Prain, Bengal Pl., ed. 1, 1127. 1903; Ruhl. in Engl., Pflanzenreich 13 (4-30): 62, 74, 78, & 287. 1903; Fyson, Fl. Nilg. & Puln. Hill-tops 1: 431. 1915; Fyson, Journ. Indian Bot. 2: 150, 206, 260, & 320, pl. 10. 1921; Haines, Bot. Bihar & Orissa 6: 1066 & 1068. 1924; Duthie, Fl. Upper Ganget. Plain 3: 318 & 319. 1929; Stapf, Ind. Lond. 3: 91. 1930; Sprague, Kew Bull. Misc. Inf. 1933: 385. 1933; Moldenke, Known Geogr. Distrib. Erioc. 21--25, 27, 40, & 41. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 879. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 117, 123, 125, 127, 130, 134, & 206. 1949; Moldenke, Phytologia 3: 398--399. 1950; Moldenke in Humbert, Fl. Madag. 36: 17--18. 1955; Santapau & Raizada, Ind. For. Rec. 4 (6): 167. 1955; Moldenke, Résumé 145, 156, 159, 162, 167, 173, 291, 293, 415, & 483. 1959; Moldenke, Résumé Suppl. 1: 11, 17, & 18. 1959; Van Royen, Blumea 10: 135. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 879. 1960; D. N. F. Kiehl, Blumea 10: 657. 1960; Moldenke, Résumé Suppl. 3: 17, 18, & 32 (1962) and 4: 7. 1962; G. L. Shah, Bull. Bot. Surv. India 4: 237. 1962; Prain, Bengal Pl., ed. 2, 2: 848. 1963; Moldenke, Résumé Suppl. 6: 8. 1963; Bhattacharyya, Bull. Bot. Surv. India 6: 208. 1964; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 2, 341. 1964; Thanikaimoni, Pollen & Spores 7: 186. 1965; Moldenke, Résumé Suppl. 12: 8. 1965; Datta & Majumdar, Bull. Bot. Soc. Bengal 20: 39. 1966; Moldenke, Résumé Suppl. 15: 20. 1967; Santapau, Bull. Bot. Surv. India 8: 48. 1967; Backer & Bakh., Fl. Java 3: 25--26. 1968; Moldenke, Résumé Suppl. 17: 11. 1968; Moldenke, Phytologia 17: 463 & 489 (1968), 18: 102, 186, 264, 274, 302, 328, 348, 362, 429, & 433--435 (1969), and 19: 24, 36, 46, & 78. 1969; M. A. Rau, Bull. Bot. Surv. India 10, Suppl. 2: 84. 1969; Moldenke, Phytologia 19: 232 & 346. 1970.

Illustrations: Royle, Illustr. Bot. Himal. pl. 97, fig. 1 a, b, d--f, & i [in color]. 1840; Fyson, Journ. Indian Bot. 2: pl. 10. 1921.

Herb; roots fibrous, fasciculate, spongy, glabrous, white; stems very short; leaves erect-caespitose, linear, slightly attenuate from the base to the apex, flat, not drying red, membranous, 1.3--9.5 [usually 3--9] cm. long, 1.6--3 mm. wide at the midpoint, the apex itself rather obtusish or obtuse, pellucid, glabrous, fenestrately 9--11-veined, the veins longitudinal and subequally strong; peduncles aggregate, up to 16 per plant, erect, 5--40 cm. long, herbaceous, 5- or 6-costate, twisted, glabrous; sheaths rather loose or lax, obliquely split, subpellucid, 1.4--6 cm. long, fenestrately striatulate or venose, glabrous, the mouth subentire, the blade thin-membranous at the apex; heads finally sibglobose, nigrescent-olivaceous, 3--5 mm. wide, very shortly and sparsely white-villosulous; involucre bractlets 5 or more, oblong or spatulate-obovate, membranous, bright-green or pale greenish-gray, finally nigrescent, at first equaling the disk, at least a few finally conspicuously reflexed and shorter than the disk, obtuse at the apex, glabrous; receptacular bractlets narrowly obovate-cuneate or lanceolate, olivaceous or nigrescent, drying dirty-black, equaling

the florets, membranous, rather obtusish or acutish at the apex, short-pilose or puberulent with scattered hairs toward the apex; receptacle glabrous or pilose; florets subsessile; staminate florets: sepals 3, spathaceous-connate to the middle, free at the apex, oblong, anteriorly split, olivaceous, obtuse or subtruncate at the apex, short-pilose or puberulent with a few scattered hairs toward the apex; petals connate into a solid tube which is 3-lobed at its apex, the lobes small, ciliate, with a dark gland below the apex within, the anterior one larger; stamens 6, the 3 opposite the corolla-lobes scarcely larger; anthers rounded, black; pistil-rudiment in the center, dark, effete, glandulose, 3-parted; pistillate florets: sepals 3, separate, oblong, subequal, olivaceous, acute or obtusish at the apex, keeled, narrowly spongy-alate on the back, short-pilose with scattered hairs at the apex; petals 3, inserted at the same level as the sepals or slightly higher, separate, linear-spatulate, whitish, obtuse at the apex, short-puberulent within, with a dark gland below the apex on the inner surface; ovary sessile or short-stipitate, 3-celled; style equalling the ovary in length; stigmas 3, filiform; seeds ovate, yellowish-fuscescent, densely covered with hair-like thickened hyaline cells in parietal transverse lines.

It is worth noting here that the E. quinquangulare L., referred to in the synonymy above, is a valid species, with the homonym accredited to Wight as a synonym, while that accredited to Heyne is E. cristatum Mart., that credited to Wallich is E. nepalense Prescott, and that credited to Bojer is still not placed satisfactorily, and the E. subulatum N. E. Br. is also a valid species. Eriocaulon sollyanum var. sumatranum Van Royen is regarded by me as a synonym of E. merrillii Ruhl.; E. heterolepis & genuinum Körn. appears to be based on Stocks, Law, &c. s.n. [Malabar, Concan, &c.] in the Berlin herbarium; E. quinquangulare Willd. is based on König s.n. [India orientalis], also in the Berlin herbarium, E. 5-angulare var. erythropodum Miq. is based on Hohenacker 131 in the Munich herbarium, and E. 5-angulare var. pusillum Körn. is based on König s.n. [Trankenbar], also at Munich. Stapf (1930) erroneously dates the Royle (1840) plate as "1839".

Fyson (1921) describes E. trilobum Hamilt. as follows: "Habit of E. quinquangulare L., but the heads as a rule smaller, 1/8 -- 1/6 in diam., darker, and the involucre bracts more conspicuously reflexed. Leaves not drying red.....N.W. Himalayas; Kumaon; Dharmasala; Bengal in rice fields (Wallich). This species exactly resembles E. Dianae, var. triloboides in the Bombay Presidency, except in the reduction in the latter of one female sepal. I am however uncertain of the identification of the sheets in the Calcutta Herbarium, for Koerniche describes the female sepals as 'carinatae, dorso anguste spongioso alatae', which they are not in these plants, yet there does not appear to be any other plant from Bengal to answer to the rest of the description." Under his E. dianae var. triloboides (now regarded as a synonym of E. collinum

Hook. f.) he says "*Capitula nigra aut nigrescentia globosa.....* Khandala to Wynaad. Leaves as in var. a [=typica]. Heads globose, dark almost black, distinguished only by the third female sepal being linear from E. trilobum Ham. This variety has in consequence frequently been identified as that species. See p. 139, fig. 3, which is of this plant, but wrongly named E. trilobum on p. 150, also see p. 206."

The species has been recorded from Zanzibar and Japan in addition to the countries listed in the citations below.

Backer & Bakhuizen van den Brink (1968) describe the plant as follows: "All leaves in a radical rosette. Terrestrials. Interfloral bracts in their upper halves or on their tops with numerous short white hairs. Involucral bracts, peduncles and leaves glabrous; heads less than 8 mm. across. Leaves at best 10 cm. long, often much less. Heads globose-oblate, 4—7 mm. across, blackish grey; interfloral bracts very dark-coloured, with a triangular, rather acute top; apical hairs short but not very minute; involucral bracts of old heads often reflexed and more or less concealed by the flowers; ♂ sepals 3, vaulted, connate into a unilaterally cleft sheath with a rounded, dark-coloured, short-hairy top; petals 3 (1 of them much the largest), all with a gland below the top; anthers 6, dark-coloured; ♀: sepals 3, pubescent, 2 of them navicular with a strongly keeled-winged back, the 3rd much narrower and less strongly vaulted; petals 3, with a gland below the top; style 3-fid. Outermost involucral bract oval-obovate, broadly rounded; receptacle densely villous. Leaves 3—10 cm. long. 0.07—0.35; I—XII; W. C. E., local; 1500—2000; swamps; locally sometimes numerous (E. trilobum Buch.-Ham. ex Koern.)."

This plant has been found by collectors in marshy waterlogged soil, marshy pastures, moist soil near rivers, open moist or marshy ground, riverbeds, and grassy rocky fields, on rocky ground and even on rocks in midstream, at altitudes of 1500 to 3000 meters, flowering and fruiting in every month of the year, although Datta & Majumdar (1966) aver that it flowers only from September to November. Bhattacharyya (1964) describes it as "occasional in marshy places"; Prain (1903) calls it an "herb of rice-fields and wet places....in all the provinces" of Bengal; Santapau & Raizada (1955) refer to it as "Another rare plant; seen only in moist ground in the river bed at Sasan" in Saurashtra. In Bombay, according to Santapau, it may be "locally abundant, but rare on plateau", "very rare, only one small patch seen in marshy ground", "not abundant among grasses in rocky ground", or "very common and abundant in grass fields", "some growing among grasses and other low herbs, others in almost bare ground of empty pools, rarely in flower". This same distinguished collector tells us that in Orissa it is "rare in moist cultivated fields", "common but not abundant in moist soil", or "masses in flower in rice fields".

The Sørensen, Larsen, & Hansen 5294 specimen; cited below, is immature. Of Santapau 16498 the collector notes "probably more than one species, in moist soil of river bed" in Saurashtra. Koelz

19398 is a mixture with E. cinereum R. Br., E. luzulaefolium Mart., and E. oryzetorum Mart.; E. Schmid 827 is a mixture with E. leucomelas Steud.; and Wight 2367F appears to be a mixture with E. quinquangulare L. Fyson (1915) notes that "Perhaps Schmidt left hand plant on sheet marked E. trilobum from Kaity, etc., in cover of E. collinum at Kew" is actually E. christopheri Fyson. Wallich (1832) regarded E. trilobum Hamilt. as a synonym of E. quinquangulare L. Jackson (1893) dates the Körnische synonyms as "1854", but they were not actually published until 1856.

Material has been misidentified and distributed in herbaria under such names as E. dianeae var. longibracteatum Fyson, E. erythropodum Miq., E. gracile Mart., E. heterolepis Steud., E. quinquangulare L., E. septangulare With., E. sieboldianum Sieb. & Zucc., E. truncatum Hamilt., E. zambesiense Ruhl., E. 5-angulare var. pusillum Körn., Eleocharis sp., and even Eragrostis sp.

On the other hand, the Kjellberg s.n. [Papandajan], Kuntze 5686, and Van Steenis 4298, distributed as E. sollyanum, are all actually E. hookerianum Stapf, Wight 2856 is E. leucomelas Steud., and Heyne 12, G. Thomson s.n. [Maisor & Carnatic], and Wight 16 & 2367 are E. quinquangulare L.

Additional citations: MADAGASCAR: Bojer 79 (P). PAKISTAN: East Bengal: W. Griffith 5586 (C); F. Hamilton 23 (Br); Herb. Schreber 1791 (B); König s.n. [Selampur] (Mu--259); S. Kurz s.n. [Bengal] (Mu--315); Wallich 6072b (B). INDIA: Bombay: Bole 1538 (Xa); Ezekiel 30361 (N, Xa); R. R. Fernandez 1892 (Xa), R. 298 (Xa), R. 1160 (Xa), R. 2110 (Xa), R. 2110a (Xa); Hohenacker 131c (Ut-312); N. A. Isam 1171 (Xa); Kapada & Fernandez s.n. [20th Oct. 1954] (Xa); Mrs. Lisboa s.n. (N, Xa); Patel 1 (Lw); Santapau 10829 (Xa), 10905 (Xa), 10907 (Xa), 11562 (Xa), 11687 (Xa), 11691 (Xa), 13028 (Xa), 13950 [2] (Xa), 14966 (Xa), 15991 (Xa), 18747 (Xa), 18965 (Xa), 18966 (Xa), 19277 (Xa), 19278 (Xa), 19702 (Xa), 19703 (Xa), 19786 (Xa), 19787 (Xa), 21103 (Xa), 21169 (Xa); L. J. Sedgwick 701h (Xa), 27749 (Xa); Stocks, Law, &c. s.n. [Malabar, Concan, &c.] (B, Br, Mu--227, S). Kashmir: J. R. Drummond 15053 (Ca--246494). Kerala: Hohenacker 131 (Mu--228). Khasi States: Schlagintweit 188 (S). Madras: E. K. Janaki 737 (Mi); König s.n. [Trankenbar] (Mu--229); Macé s.n. (B); Saulière 71 (Ca--235475); E. Schmid 827, in part (B). Mysore: S. N. Ramaswamy 4 (Rf). Orissa: Santapau 21400 (Xa), 21429 (Xa), 21450 (Xa); S. K. Wagh 4705 (Xa), 4720 (Xa), 4728 (Xa). Saurashtra: Santapau 16498 (Xa, Xa, Z). Surguja: Koelz 19398, in part (Mi, N). Travancore: E. W. Erlanson 5140 (Mi). West Bengal: Bennett 1014 (Ac). State undetermined: F. Hamilton s.n. [Botanical Garden, 10 Jan. 1819] (Br); Klein 85 (B); König s.n. [India orientalis] (B); Patel s.n. [Igatpuri, October 20th, 1882] (Xa); Sonnerat s.n. [India orienta-

lis] (P); T. Thomson s.n. [Plan. Ganget. Inf.] (B, M, Mu—257, S); Wallich 6072 [India orientalis] (Mu—258); R. Wight 2367 (N), 2367F, in part (Ca—184359). CEYLON: Walker 14 (B). THAILAND: Sørensen, Larsen, & Hansen 5294 (S). INDOCHINA: Laos: Pételot 8972 (N), 8973 (N). CHINA: Fukien: Chang & Metcalf 163 (Ca—249084). Yunnan: G. Forrest 11773 (Ca—231222). LOCALITY OF COLLECTION UNDETERMINED: Herb. Link s.n. (B); Herb. Martius s.n. (Br); Herb. Mus. Paris. s.n. [Cayenne?] (P); Herb. Schreber s.n. (Mu—223); Herb. Swartz 16 (B). MOUNTED ILLUSTRATIONS: drawings & notes by Körnicker (B).

ERIOCAULON SONDERIANUM Körn.

Bibliography: Körn., Linnaea 27: 669. 1856; C. Müll. in Walp., Ann. 5: 926 & 943—944 (1860) and 6: 1171. 1861; Rendle, Cat. Afr. Pl. Welw. 2 (1): 99. 1899; Ruhl. in Engl., Bot. Jahrb. 27: 71 & 81. 1899; Ruhl. in Engl., Pflanzenreich 13 (4-30): 62, 75, & 287. 1903; H. Lecomte, Bull. Soc. Bot. France 55: 644 & 648. 1909; Arwidsson, Bot. Notiser 1934: 83. 1934; J. Hutchinson, Botanist in South. Afr. 406. 1946; Moldenke, Known Geogr. Distrib. Erioc. 22, 34, & 40. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 120, 122, & 206. 1949; Moldenke, Phytologia 3: 399. 1950; Moldenke, Résumé 149, 153, 292, & 483. 1959; Moldenke, Résumé Suppl. 3: 16. 1962; R. H. Compton, Journ. S. Afr. Bot. Suppl. 6: 19 & 33. 1966; Moldenke, Résumé Suppl. 16: 8. 1968.

Collectors have described this plant as a small, perennial, localized herb, often forming tufts, with small, woolly, snow-white or gray-white-and-black heads on erect scapes 2--12 inches tall from basal rosettes of somewhat fleshy leaves. It has been found growing in very wet or in intermittent wet and dry soil, at altitudes of 3000 to 6700 feet, flowering and fruiting from October to December. Compton (1966) refers to it as "grass-like in upland swamps" in Swaziland, Killick & Strey found it "locally common in vleis or summits" in Transvaal, while Deverish tells us that it is found "in poor sour soil, sometimes in running or standing water". Hutchinson (1946) cites his no. 2794. Rendle (1899) says that E. lacteum Rendle is closely related to this species. The initial letter of its specific epithet is often up-percased. Jackson (1893) dates Körnicker's original publication as "1854", but the pages here involved were not issued until 1856.

Citations: SOUTH AFRICA: Orange Free State: Flanagan 1863 (S). Transvaal: Burke s.n. [Macalis Berg, Nov.] (B, Z); Deverish 733 (Mu); Killick & Strey 2723 (Mu); Merxmüller 321 (Mu); Rehm s.n. [15.10.1949] (Mu); Repton 5770 (Mu); Scheepers 707 (Mu); Zeyher 1731 (S--isotype).

ERIOCAULON SOUCHERET Moldenke

Bibliography: Moldenke, Phytologia 4: 290—291. 1953; Moldenke, Biol. Abstr. 27: 3121. 1953; G. Taylor, Ind. Kew. Suppl. 12: 55. 1959; Moldenke, Résumé 176 & 483. 1959; Moldenke, Résumé Suppl. 6:

8. 1963; Moldenke, *Phytologia* 18: 363. 1969.

Material of this species has been misidentified and distributed in herbaria as *E. oryzetorum* Mart. and *E. truncatum* Hamilt.

Citations: THAILAND: Lindhard 20 (Cp); Sørensen, Larsen, & Hansen 5295 (Cp), 6473 (Z). INDOCHINA: Annam: Souchère 3 (N-type), 27 (N).

ERIOCAULON SPARGANIOIDES Bong.

Synonymy: *Eriocaulon sparganoides* Bong. apud C. Müll. in Walp., Ann. 6: 1171, sphalm. 1861.

Bibliography: Bong. *Mém. Acad. Sci. St. Pétersb.*, sér. 6, 1: 637, pl. 68. 1831; Kunth, *Enum. Pl.* 3: 579—580. 1841; C. Müll. in Walp., Ann. 5: 931 (1860) and 6: 1161. 1861; Körn. in Mart., *Fl. Bras.* 3 (1): 499—500. 1863; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 1: 879. 1893; Ruhl. in Engl., *Pflanzenreich* 13 (4-30): 117 & 287. 1903; Moldenke, *Known Geogr. Distrib. Erioc.* 8 & 40. 1946; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 2, 1: 879. 1946; Moldenke, *Known Geogr. Distrib. Verbenac.*, [ed. 2], 77 & 206. 1949; Moldenke, *Résumé* 89 & 483. 1959; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 3, 1: 879, 1960.

Illustrations: Bong., *Mém. Acad. Sci. St. Pétersb.*, sér. 6, 1: pl. 68. 1831.

The original description of this plant, as given by Kunth (1841), is "Acaule; foliis erectis, lineari-lanceolatis, obtusiusculis, reticulatis, glabris; pedunculis ad apicem subpubescentibus; vaginis elongatis, glabris". It is said to be a native of Brazil, no specific locality being mentioned. The plate "68" referred to in the original description was never published, according to Kunth. The initial letter of the specific epithet is up-percased by Kunth.

ERIOCAULON SPECTABILE F. Muell.

Bibliography: F. Muell., *Fragm.* 1: 95. 1859; Benth., *Fl. Austral.* 7: 191, 196—197, & 792. 1878; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 1: 879. 1893; Ruhl. in Engl., *Pflanzenreich* 13 (4-30): 33, 39, & 287. 1903; F. M. Bailey, *Compreh. Cat. Queensl. Pl.* 584. 1913; Moldenke, *Known Geogr. Distrib. Erioc.* 40 & 61. 1946; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 2, 1: 879. 1946; Moldenke, *Known Geogr. Distrib. Verbenac.*, [ed. 2], 153 & 206. 1949; Moldenke, *Résumé* 209 & 483. 1959; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 3, 1: 879. 1960.

ERIOCAULON SPHAGNICOLA Ohwi

Synonymy: *Eriocaulon sphagnicolum* Ohwi apud Satake in Nakai & Honda, *Nov. Fl. Jap.* 6: 13, 16, 81, & 87, fig. 30. 1940.

Bibliography: Ohwi, *Bot. Mag. Tokyo* 45: 196 & 389. 1931; A. W. Hill, *Ind. Kew. Suppl.* 9: 105. 1938; Satake in Nakai & Honda, *Nov. Fl. Jap.* 6: 13, 64, 81, & 87, fig. 30. 1940; Satake, *Bull. Tokyo Sci. Mus.* 4: [Rev. Jap. *Erioc.*] 53, fig. 17. 1940; Moldenke, *Known Geogr. Distrib. Verbenac.*, [ed. 2], 133 & 206. 1949; Moldenke, *Résumé* 171, 418, & 483. 1959.

Designed to expedite botanical publication

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STUDIES IN THE EUPATORIEAE (COMPOSITAE). XXII.

THE GENUS PIPTOTHRIX

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Microscopic examination of the genus Piptothrix indicates that it is closely related to the genus Ageratina. The single character by which Piptothrix has been considered distinct is the readily deciduous pappus, but this character is common in species of Ageratina. It is impossible to comprehend how botanists have been able to recognize this genus in the past and we are not able to comprehend the kind of mentality that recognizes such a genus as Piptothrix but places such things as Ageratina, Critonia, Praxelis or Eupatorium brachychaetum B.L. Robinson in the genus Eupatorium. What we recognize here as Piptothrix is based on different characters and contains a different alignment of species.

An examination of the species previously placed in Piptothrix shows that they fall into two series. One series that includes the type species P. palmeri has no evident carpopodium and no pales on the receptacle. The pappus setae in this group are not reduced in size. The second series of species has both distinct carpopodia and pales and the pappus setae are short. The tendency for more broadly ovate longer petiolate leaves and more flowers per head indicates the second series is distinct and we have found their basic characters to agree with the genus Jaliscoa. We would place in Piptothrix, Eupatorium areolare DC. a species that is often confused with others of the genus Piptothrix and which has been included in discussions of the genus by at least one author (Cronquist, 1965).

The genus Piptothrix is most markedly distinct from Ageratina by the lack of a carpopodium, but a number of the species also have inner surfaces of the corolla lobes much smoother, and the heads fewer flowered. Smaller heads with shorter flowers was one of the few characteristics that help to distinguish most of what was Piptothrix from Ageratina.

Piptothrix A. Gray, Proc. Am. Acad. 21:383.1886.

Sparingly to few branched herbs or shrubs; leaves opposite, rarely subopposite, ovate to broadly ovate, margin serrulate to serrate. Inflorescence a cymose-panicle; heads 7-18 flowered; involucre of 7-15 equal to subequal phyllaries in two series, receptacle slightly convex, glabrous to spinose. Corollas campanulate, inner surface of lobes smooth to papillose, outer surface glabrous, stomates absent. Anther collar composed of numerous quadrate cells below, elongate cells above, all with little

or no ornate thickening on the walls; exothecial cells usually lax and somewhat longer than wide; anther appendage large. Pollen spherical, tricolpate, spinose. Style often swollen at base, glabrous; surface cells of stylar appendage densely long projecting. Achenes prismatic, usually 4-5 costate, bearing setae; carpopodium indistinct; embryo usually borne high in the achene, often well sclerotized at the lower end, basal vasculature of achene usually united well above level of carpopodium; pappus of long setae often deciduous. Chromosome number not determined (numbers expected $x = 17$ as in Ageratina or $x = 16$ as in Oxylobus).

Type species: Piptothrix palmeri A. Gray

Our studies indicate that the genus contains the following five species all from Mexico.

Piptothrix areolare (A.P.Decandolle) R.M.King & H.Robinson, comb. nov. Eupatorium areolare A.P.Decandolle, Prodr. 5: 169. 1836. Chiapas, Guerrero, Jalisco, Mexico, Michoacán, Morelos.

Piptothrix jaliscensis B.L.Robinson, Proc. Bost. Soc. Nat. Hist. 31:268. 1904. Jalisco.

Piptothrix palmeri A. Gray, Proc. Amer. Acad. 21:383. 1886. Chihuahua.

Piptothrix pubens A. Gray, Proc. Amer. Acad. 22:419. 1887. Jalisco, Chihuahua.

Piptothrix sinaloae S.F.Blake, Proc. Biol. Soc. Wash. 32:190. 1919. Sinaloa.

Species Excluded

Piptothrix goldmanii B.L.Robinson = Jaliscoa goldmanii

Piptothrix paleacea A. Cronquist = Jaliscoa paleacea

Literature Cited

Cronquist, A. J. 1965. Studies in Mexican Compositae I. Miscellaneous new species. Mem. N. Y. Bot. Gard. 12: 286-292.

STUDIES IN THE EUPATORIEAE (COMPOSITAE). XXIII.

NEW COMBINATIONS IN JALISCOA

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As indicated in the study of Piptothrix, it is now possible to compare the various genera that are related to Ageratina and to reevaluate the characters by which they are distinguished from each other. A result is the deemphasis of certain characters such as the pappus and the expansion of the genus Jaliscoa from a single species as recognized in our previous treatment (1970). Various characters used to distinguish Jaliscoa, such as 4-angled achenes and fistulose or clathrate stems, are not entirely dependable. It seems far more logical to include two additional species that have been placed in Piptothrix but have paleaceous receptacles and distinct carpopodia as in Jaliscoa.

Jaliscoa S. Watson, Proc. Amer. Acad. Arts Sci. 25:153. 1890.

Sparingly to few branched herbs or shrubs; leaves opposite, rarely only subopposite or ternate, deltoid to ovate, margin crenulate-serrulate to sharply serrate. Inflorescence a cymose-panicle; heads 11-25 flowered; involucre of ca 15-20 subequal to equal phyllaries in 2 series; receptacle paleaceous, convex. Corollas campanulate, inner surface of lobes mamilllose to papilllose, outer surface glabrous, stomates absent. Anther collar composed of numerous quadrate cells below, elongate cells above, all with little or no ornate thickenings on the walls; exothecial cells in part usually lax and somewhat longer than wide; anther appendage large. Pollen spherical, tricolpate, spinose. Style sometimes swollen at base, glabrous; surface cells of stylar appendage densely long projecting. Achenes prismatic, usually 4-5 costate, glabrous or usually bearing a few setae near the top; carpopodium distinct, sometimes large; embryo usually borne high in the achene, often well sclerotized at the lower end, basal vasculature of achene usually united well above level of carpopodium; pappus an obscure, callous border or a lacerate-fimbriate crown or rather short deciduous setae. Chromosome number not determined. (numbers expected $x = 17$ as in Ageratina or $x = 16$ as in Oxylobus).

Type species: Jaliscoa pringlei S. Watson

Our studies indicate that the genus contains the following three species all from Mexico.

Jaliscoa goldmanii (B.L.Robinson) R.M.King & H.Robinson, comb.

nov. Piptothrix goldmanii B.L.Robinson, Proc. Amer. Acad.
35:328. 1900. Chihuahua, Jalisco.

Jaliscoa paleacea (Cronquist) R.M.King & H.Robinson, comb. nov.
Piptothrix paleacea Cronquist, Mem. N.Y. Bot. Gard. 12:289.
1965. Jalisco.

Jaliscoa pringlei S. Watson, Proc. Amer. Acad. Arts Sci. 25:153.
1890. Jalisco, Michoacán, Morelos.

Species synonymized

Piptothrix aegiroides B.L.Robinson = J. goldmanii
Jaliscoa pappifera S.F.Blake = J. pringlei

Literature Cited

King, R.M. and H.Robinson 1970. Studies in the Compositae-
Eupatorieae, XV. Jaliscoa, Macvaughiella, Oaxacania and
Planaltoa. Rhodora in press.

STUDIES IN THE EUPATORIEAE (COMPOSITAE). XXIV.

A NEW GENUS STOMATANTHES

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The Eupatorieae are a group primarily of the western hemisphere. Only three of the described genera, Eupatorium, Mikania, Adenostemma are believed to be native in the eastern hemisphere, but most of the species of these genera are in the west. It now appears that buried in the genus Eupatorium is a species which represents the only eupatorian genus endemic to the eastern hemisphere.

Stomatanthes africanus is most distinctive in the possession of numerous stomates on the backs of the corolla lobes. From Eupatorium it also differs by the highly ornate walls in the cells of the anther collar, by the numerous hairs on the outer surface of the corolla lobes, the numerous setae on the achene, by the very distinct carpopodium, by the primarily alternate leaves, by the smaller number of flowers and phyllaries, and the subacute apical cells of the pappus setae. Other genera with which it might be compared include Eupatoriadelphus which differs by whorled leaves, inornate anther collars, few or no hairs or setae on the corolla or achene, an enlarged stylar node, and the larger number of flowers and phyllaries; Austroeupatorium which has ornate anther collars and distinct carpopodia but is otherwise most like Eupatorium; and Campuloclinium which has opposite leaves, an enlarged stylar node, no stomates on the corolla lobes, more papillose corolla lobes and smoother style branches. After evaluating the distinction of Stomatanthes, we would relate it to that series of the Eupatorieae which we refer to as Eupatorioid as contrasted with Ageratinioid, Campuloclinioid or Critonioid.

Stomatanthes africanus seems to occur in two forms, plants with four phyllaries and four flowers and plants with five phyllaries and five flowers. Plants seem rather consistent in this distinction. The heads of plants with four phyllaries and four flowers show a superficial resemblance to those of the genus Mikania.

The stomates in the corollas of Stomatanthes are of particular interest. They are not as obvious or as numerous in any other genus. Stomates can be difficult to observe but careful checking has demonstrated their presence in only two other genera. In Eupatoriadelphus one or two rather lax stomates occur on each corolla lobe. The south american genus Microconia has a single small stomate in the middle of the back of each corolla lobe. All three of the genera with stomates on the

corolla have hairs on the styler nodes. The significance of this coincidence is yet to be determined but there are some indications that hairy styler nodes are primitive in at least some lines in the Eupatorieae.

Stomatanthes presents one very serious problem. The genus Eupatorium which comes closest geographically cannot be an ancestral form. Eupatoriadelphus, which has a few stomates, may be more closely related but is strictly north american. South America offers no likely relatives either. It seems very strange that the species should have no close relatives either in Africa or elsewhere.

Stomatanthes R.M.King and H.Robinson, genus novum Compositarum (Eupatorieae). Plantae perennes herbaceae vel suffrutescentes paucè vel dense ramosae. Folia alterna, raro subopposita, petiolo perbrevis. Inflorescentiae dense corymbosae. Involucri squamae 4 subaequilongae late vel anguste lanceolatae interdum 1-2 extraneae breviores; receptacula glabra. Flores 4-5 in capitulo; corollae tubulares extus abundanter glanduliferae et setiferae, cellulis angustis, parietibus sinuosis, lobis extus manifeste stomatophoris; filamenta antherarum in parte superiore magna, cellulis numerosis plerumque quadratis, parietibus dense reticulate ornatis, cellulis exothecialibus subquadratis vel brevioribus antherarum appendicibus longis; styli inferne dense hirsuti, appendicibus valde papillatis; achaenia prismatica 5-8 costata dense setifera et glandulifera; carpopodia distincte rotundata, cellulis parvis quadratis interdum protuberantibus, parietibus potius tenuibus; pappi setiformes valde scabri, cellulis apicalibus subacutis.

Species typica: Eupatorium africanum Oliv. et Hiern.

Chromosome number determined as $x = 10$ (Turner & Lewis, 1965).

Stomatanthes africanus (Oliv. et Hiern.) R.M.King and H. Robinson, comb. nov. Eupatorium africana Oliv. et Hiern. in Oliver, Fl. Trop. Afr. 3:301. 1877. Angola, Congo, Ethiopia, Nyasaland, Tanganyika, Transvaal.

Literature Cited

Turner, B.L., and W.H.Lewis 1965. Chromosome Numbers in the Compositae. IX African Species. Jour. S. Afr. Bot. 31(3):207-217.

STUDIES IN THE EUPATORIEAE (COMPOSITAE). XXV.

A NEW GENUS EUPATORIADELPHUS

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Four species of verticillate leaved Eupatorieae in the eastern United States form a natural and distinctive group which many people mistakenly consider typical of the genus Eupatorium. The four species were the only representatives of Eupatorium in America according to E.L.Greene (1903). Actually, the type species of Eupatorium is the European E. cannabinum Linnaeus which does not have verticillate leaves, and which agrees very well generically with such American species as E. capillifolium (Lam.) Small, E. perfoliatum Linnaeus, E. rotundifolium Linnaeus and E. serotinum Michaux.

Eupatoriadelphus, the genus that we are establishing for these four species, is most readily distinguished by the verticillate leaves, but also has stomates on the backs of the corolla lobes and tendencies for distinct carpopodia, more pointed pappus setae, and occasional hairs on the tube of the corolla or setae on the achene, all characters not found in Eupatorium. This group of species has been distinguished in the past by Decandolle as section Verticillata of Eupatorium. The species have since been treated independently by Wiegand and Weatherby (1937). The cytology has been reviewed by Grant (1953).

Of the many genera that must be removed from the previous artificial concept of Eupatorium, Eupatoriadelphus is the only one that really seems at all closely related to that genus. As recognized here both Eupatorium and Eupatoriadelphus are entirely natural concepts each having specializations not found in the other.

Eupatoriadelphus R.M.King and H.Robinson, genus novum Compositarum (Eupatorieae). Plantae herbaceae pauce ramosae. Folia verticillata, petiolo brevi. Inflorescentiae corymbosae. Involucri squamae 12-22 valde inaequilongae multiseriatae imbricatae; receptacula convexa glabra. Flores 5-20 in capitulo; corolla tubulares extus superne glanduliferae inferne interdum parce setiferae, cellulis angustis parietibus sinuosis, lobis extus pauce stomatophoris; filamenta antherarum in parte superiore distincta, cellulis inornatis plerumque quadratis, cellulis exothecialibus quadratis vel breve oblongis, appendicibus antherarum longis; styli inferne nodulosi dense hirsuti, appendicibus

leviter papillatis; achaenia prismatica 5-costata glandulifera; carpodia saepe distincta, cellulis laxis subquadratis, parietibus tenuibus; pappi setiformes scabri, cellulis apicalibus acutis vel subobtusis.

Species typica: Eupatorium purpureum Linnaeus

Chromosome numbers determined as $2n = 20, 40$ (Grant, 1953).

Our studies indicate that the genus contains the following four species all from eastern North America.

Eupatoriadelphus dubius (Willd. ex Poir) R.M.King & H.Robinson, comb. nov. Eupatorium dubium Willd. ex Poir, Encyc. Suppl. 2:606. 1811.

Eupatoriadelphus fistulosus (Barratt) R.M.King & H.Robinson, comb. nov. Eupatorium fistulosum Barratt, Eup. Vert. no 1, 1841.

Eupatoriadelphus maculatus (Linnaeus) R.M.King & H.Robinson, comb. nov. Eupatorium maculatum Linnaeus, Cent. Pl. 1:27. 1755.

Eupatoriadelphus purpureus (Linnaeus) R.M.King & H.Robinson, comb. nov. Eupatorium purpureum Linnaeus, Sp. Pl. 838: 1753.

Literature Cited

- Grant, W.F. 1953. A Cytotaxonomic Study in the Genus Eupatorium. Amer. Jour. Bot. 40(9):729-742.
- Greene, E.L. 1903. Neglected Eupatoriaceous genera. Leaflet. Bot. Obs Crit. 1: 7-13.
- Wiegand, K.M. and C.A. Weatherby 1937. II. The Nomenclature of the Verticillate Eupatoria. Rhodora 39:297-306. pl. 466-468.

STUDIES IN THE EUPATORIEAE (COMPOSITAE). XXVI.

A NEW GENUS AUSTROEUPATORIUM

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Austroeupatorium is established for a series of South American species including the widely distributed and sometimes adventive, A. inulaefolium (H.B.K.) R.M.King & H.Robinson. The genus shares a number of characters with Eupatorium such as hairy styler node, usually glandular corollas and achenes, smooth corolla lobes, and often blunt tipped pappus setae. The leaves of Austroeupatorium tend to be alternate in parts of the inflorescence as in Eupatorium. Some species are unlike Eupatorium in being more extensively alternate leaved. Austroeupatorium is most strikingly distinct from Eupatorium in the annular thickenings in the walls of the anther collar cells and in the highly developed carpopodia. The geographic ranges of the two genera do not overlap.

Austroeupatorium R.M.King and H.Robinson, genus novum Compositarum (Eupatorieae). Plantae herbaceae pauce ramosae. Folia inferna opposita superna plerumque subopposita vel alterna breve petiolata. Inflorescentiae corymbosae. Involucris squamae 12-18 plerumque inaequilongae 2-3-seriatae imbricatae; receptacula glabra. Flores 9-23 in capitulo; corollae tubulares inferne aliquantum angustae extus glanduliferae, cellulis angustis parietibus sinuosis, stomatibus nullis; filamenta antherarum in parte superiore angusta, cellulis plerumque quadratis parietibus tranverse annulatis, cellulis exothecialibus subquadratis, appendicibus antherarum longis; styli inferne dense hirsuti, appendicibus plerumque leviter papillatis; achaenia prismatica 5-costata plerumque glandulifera non setifera; carpopodia distincta interdum elongata, cellulis laxis subquadratis vel longioribus, parietibus tenuibus; pappi setiformes scabri, cellulis apicalibus saepe obtusis.

Species typica: Eupatorium inulaefolium H.B.K.

Chromosome numbers determined as $n = 10$ (Coleman, 1968; Powell & King, 1969).

Our studies indicate that the genus contains the following eleven species.

Austroeupatorium chaparense (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium chaparense B.L.Robinson, Contr. Gray Herb. 90:24. 1930. Bolivia.

Austroeupatorium entleriense(Hieron.) R.M.King & H.Robinson,
comb. nov. Eupatorium entleriense Hieron. Engl. Bot. Jahrb.
22:767. 1897. Uruguay.

Austroeupatorium inulaefolium(H.B.K.) R.M.King & H.Robinson,
comb. nov. Eupatorium inulaefolium H.B.K., Nov. Gen. et Sp.
4: 109. ed. fol. 1818. South America, adventive in Indonesia.

Austroeupatorium laetevirens(Hook & Arn.) R.M.King & H.Robinson,
comb. nov. Eupatorium laetevirens Hook. & Arn. in Hook.
Comp. Bot. Mag. 1:240. 1835. Brazil, Paraguay.

Austroeupatorium mapiriense(Hieron) R.M.King & H.Robinson, comb.
nov. Eupatorium mapiriense Hieron. Engl. Bot. Jahrb. 40:
374. 1908. Bolivia.

Austroeupatorium monardaefolium(Walp.) R.M.King & H.Robinson,
comb. nov. Eupatorium monardaefolium Walp. Linnaea 14:505.
1840. Brazil.

Austroeupatorium neglectum(B.L.Robinson) R.M.King & H.Robinson,
comb. nov. Eupatorium neglectum B.L.Robinson, Contr. Gray
Herb. n.s. 68:28. 1923. Brazil.

Austroeupatorium paulinum(A.P. Decandolle) R.M.King & H.Robinson,
comb. nov. Eupatorium paulinum A.P. Decandolle, Prodr. 5:158.
1836. Brazil.

Austroeupatorium petrophilum(B.L.Robinson) R.M.King & H.Robinson,
comb. nov. Eupatorium petrophilum B.L.Robinson, Contr. Gray
Herb. 77:27. 1926. Brazil.

Austroeupatorium picturatum(Malme) R.M.King & H.Robinson, comb.
nov. Eupatorium picturatum Malme, Kgl. Sv. Vet. Akad. Handl.
32 no.5:41, pl.4, fig. 11. 1899. Brazil.

Austroeupatorium rosmarinifolium(Sessé et Moc.) R.M.King & H.
Robinson, comb. nov. Eupatorium rosmarinifolium Sessé et
Moc., La Naturaleza, ser. 2,1, app. 133. 1889. Brazil.

Austroeupatorium tweedleanum (Hook. & Arn.) R.M.King & H.
Robinson, comb. nov. Eupatorium tweedleanum Hook. & Arn.
in Hook. Comp. Bot. Mag. 1:242. 1885. Brazil, Paraguay.

Literature Cited

Coleman, J.R. 1968. Chromosome numbers in some Brazilian Compositae. *Rhodora* 70: 228-240.

Powell, A.M. and R.M.King 1969. Chromosome numbers in the Compositae: Colombian species. *Amer. J. Bot.* 56: 116-121.

FURTHER NEW COMBINATIONS AND VARIETIES OF VERBENACEAE

Harold N. Moldenke

Gmelina MOLUCCANA var. ELLIPTICA (Moldenke) Moldenke, comb. nov.
Gmelina salomonensis var. elliptica Moldenke, *Phytologia* 18:
71. 1969.

Gmelina MOLUCCANA f. GLABRESCENS (Moldenke) Moldenke, comb. nov.
Gmelina salomonensis f. glabrescens Moldenke, *Phytologia* 4:
178. 1953.

JUNELLIA CONGESTA (Troncoso) Moldenke, comb. nov.
Verbena congesta Troncoso, *Darwiniana* 14: 631-633, fig. 1.
1968.

LANTANA RIEDELIANA var. PUBESCENS Moldenke, var. nov.
Haec varietas a forma typica speciei ramulis petiolisque
foliisque dense pubescentibus recedit.

This variety differs from the typical form of the species in
having its young branchlets, petioles, peduncles, and both leaf-
surfaces densely pubescent.

The type of the variety was collected by Guido F. J. Pabst
(no. 9310) at 2000 meters altitude at Itatiaia, "km. 10 da estrada
de Registro para o Planalto", Rio de Janeiro, Brazil, on February
17, 1969, and is deposited in my personal herbarium at Plainfield,
New Jersey. The collection is also no. 42395 in the Brade Her-
barium at Rio de Janeiro. The collector describes the plant as
a shrub, 1 meter tall, with rose-colored flowers.

PHYLA STRIGULOSA var. SERICEA (Kuntze) Moldenke, comb. nov.
Lippia nodiflora var. normalis f. sericea Kuntze, *Rev. Gen.*
Pl. 2: 508. 1891.

BOOK REVIEWS

Alma L. Moldenke

"MICROBIOLOGICAL METHODS" by C. H. Collins, xii & 404 pp., illus., 2nd edition, Laboratory Techniques Series. Plenum Press, New York, N. Y. 10011, Butterworth & Co., London. 1967. \$12.50.

The author calls this work a "bench" book; it is pretty much a bible of microbiological techniques for workers and examination candidates in the British Isles. It is an interesting source for comparison among American technicians and schools.

This second edition has added some more modern taxonomy, some revised and new techniques, and a needed final chapter by C. E. D. Taylor on complement fixation. The format of the book remains the same with Part I as introduction to bacteria, (other) fungi and serology; Part II on apparatus, media and other materials and technical methodology; Part III on the main groups of micro-organisms of economic and pathogenic importance; Part IV on applied microbiology in reference to water, to all dairy products, to fresh, frozen, dried and canned foods, to container contaminants, to antibiotics and disinfectants, to assays and to "lab" safety measures. The diagram on p. 7 of a generalized bacterium will bother many trained readers.

"PLANT DIVERSITY" by Robert M. Harris, ix & 96pp., illus., Concept of Biology Series, William C. Brown Company, Dubuque, Iowa 52001. 1969. Paper-back \$1.95.

In the author's words "This is a brief résumé of the major plant groups" "based primarily on several years of experience in teaching a beginning course on the plant kingdom to university students." It is just typical text material provided with good photographs taken mainly from living materials and fortunately not laden with excessive terminology. On p. 53 the second word, "rhizoids", should have been "roots".

"THE EVOLUTION AND CLASSIFICATION OF FLOWERING PLANTS" by Arthur Cronquist, x & 396 pp., illus., Riverside Studies in Biology Series, Houghton Mifflin Company, Boston 02107, New York 10036, Atlanta 30305, Geneva, Illinois 60134, Dallas 75235, & Palo Alto 94304. 1968. \$6.95.

This fine, concise work is new not only in date of publication but also in many of its basic concepts modernizing the Besseyan approach which previously modernized for this country, at least, the Englerian system. These new concepts are shared to a considerable degree by Armen Takhtajan and Walter Zimmerman and will probably provide the main direction for many years ahead throughout the world.

After defining taxonomy as "a study aimed at producing a system of classification of organisms which best reflects the totality of their similarities and differences", the author explains lucidly the natural system, typological concepts, character evaluation and the phylogenetic concept. After logically eliminating other sources, he accepts provisionally the seed-fern origin of the angiosperms and then traces the evolution and development of each of the characters of a plant.

Then the subclasses, orders and families of dicots as class Magnoliatae are keyed out synoptically to show spread and limit to each group. The monocots as class Liliatae are similarly treated. All these angiosperms are grouped in phylum (?) Magnoliophyta. Each order is described and traced. Of course a group as comprehensive as the Rosales needs almost all terms in the glossary except parallel veining. This is the first American work in which orders are meaningfully organized, delimited and associated.

In terms of today's book market the price is most reasonable. On p. viii the word "present" is misspelled.

There is much for the student and botanist in this book.

"VIRUSES IN PLANT HOSTS — Form, Distribution, Pathological Effects" by Katharine Esau, viii & 225 pp., illus., University of Wisconsin Press, Madison, Wisconsin 53701, Milwaukee, Wisconsin, & London. 1968. \$10.00.

This book has been developed very promptly from three illustrated lectures in the John Charles Walker Series in Plant Pathology for 1968 presented by the dean of plant anatomists, Katherine Esau, and based upon her own researches on both the non-selective tobacco mosaic virus (TMV) in Nicotiana tabacum L. and the phloem-selecting, ultimately necrotic beet yellows virus (BYV) in Beta vulgaris L. The text gives the most recent data and ideas available in clearly delineated prose validated by 135 excellently printed, labeled and legended electron micrographs. The prepared material was post-fixed with osmium tetroxide. Observations and photography were then made with a Siemens Elmiskop I.

Viri are typically distributed erratically throughout plant tissues. The cytoplasm is the most common site; the nucleus next, especially for TMV; then plastids of all kinds and the endoplasmic reticulum. The site for synthesis is not yet ascertained. Viri have not been found in dictyosomes, mitochondria or vacuoles. Symptoms produced vary in kind and degree and are not necessarily correlated with the amount of virions in the protoplast. Chloroplasts seem to be the most vulnerable.

If the virus brings only genetic information material (DNA or RNA) to the host cell, then the continued comparison of the production of TVM X-material with the similar P-protein of phloem cells may prove very interesting.

A valuable really modern bibliography is given with 133 papers enumerated, of which 14 are the author's own work.

For a book that is half photographs the price is amazingly reasonable.

"BIOGEOGRAPHY AND ECOLOGY IN SOUTH AMERICA" edited by E. J.

Fittkau, J. Illies, H. Klinge, G. H. Schwabe & H. Sioli.

Volume I - xvi & 447 pp., illus., Volume II - xi & 449-946 pp., illus. (Monographiae Biologicae vols. 18 & 19), Junk, The Hague, Netherlands. 1968 & 1969. \$20.80 or 75 Dutch Guilders each.

These books offer the national or regional worker in biological problems an overall continental view. They are also helpful reading for scientifically inclined visitors to South America and for persons interested in biogeography and descriptive ecology. All the writers, including the editors, spent much time studying their specialties on and in South America.

Considering that there are 30 authors, that these papers are written in or translated into English, in German and one each in Spanish and in Portuguese, and that there is a great range in topics - the volumes seem fairly well organized. For want of authors some highly pertinent topics (bromeliads, etc.) are omitted. The whole work is indexed. Bibliographies varying in depth and scope are given with each paper.

The excellent colored FAO soil map of the continent is included along with the listing of the outstanding features, such as low natural fertility, severe water deficiency in many huge areas, and poor drainage systems elsewhere.

Many of the authors who considered the Gondwanaland problem will now have many of their doubts answered by the recent highly publicized research reports.

Plants are naturally mentioned throughout the volumes and in such special papers as H. Brücher's "Südamerika als Herkunftsraum von Nutzpflanzen", F. C. de Camargo's "Agricultura na América do Sul", H. Weber's "Zur Natürlichen Vegetationsgliederung von Südamerika", C. A. Menéndez "Die Fossilen Floren Südamerikas", R. Grolle's "Grossdisjunktionen in Artarealen Latein-Amerikanischer Lebermoose", and F. Buxbaum's "Die Entwicklungswege der Kakteen in Südamerika".

In the discussion of mangroves Avicennia schaueriana is misidentified as A. tomentosa, while A. germinans masquerades under the name A. nitida.

Necessary ecologically well-based warnings come especially from H. Brücher about accelerating erosion and gene pool loss of originators of several of the world's cultivated plants and from M. Acosta-Solis about preserving unique areas in secured national parks.

Surely proof-reading should have been done more carefully! The initial letter in the specific epithet "sativa" is upper-cased on pp. vii and 281; Robert Cushman Murphy comes out as "C.

Robert Murphy" on p. 62. Several words are misspelled, such as Humboldt on the dust jacket, forego on p. xi, loses and buried on p. 48, Citharexylum on p. 208, within on p. 580, Brazilian on p. 759, shields on p. 831, fissioned and ponds on p. 836, sprinkled on p. 837, and snout on p. 838.

"OUR VANISHING WILDERNESS" by Mary Louise & Shelly Grossman and John N. Hamlet, 324 pp., illus., Grosset & Dunlap, Publishers, New York, N. Y. 10010. 1969. \$14.95.

This book presents its plea through sound ecological principles in the text and through the esthetic and word appeal of its 275 exquisite photographs with over half of them in full color. (Some of them you may have admired in "The Struggle for Life in the Animal World"). It is easily readable for almost any age or interest without sacrificing scientific accuracy. It is a valuable testimonial to an important concept, to 67,000 miles of travel throughout the country and to 4 years of research and photography.

The introduction orients the reader to the enmeshing interdependent chain of all life. It is followed by an analysis of living organisms' adaptation to the varying seasons and to man's far-reaching effect upon them with the increasing amounts of CO₂ and other pollutants added to the atmosphere. The other chapters headed with maps of geographic distribution describe effectively the following habitats: (1) the wave-swept and sheltered shores with concern about man's radioactive wastes, (2) the watery lowlands with emphasis on problems of "development" in the Everglades, (3) the upland and northern forests with consideration of the far-reaching erosion flood problems accompanying much lumbering, (4) the grasslands and sagebrush country mirroring the effects of over-grazing and bounty laws, (5) the desert and the chaparral that were not always so barren, and (6) new mountains and old plateaus.

With our vanished and vanishing wildlife and its accustomed habitats, with the press of increasing population, with increasing leisure time and the spread of affluence, and with the almost fluid entity of ever proliferating cars and roads, man — as this book emphasizes so effectively — must take thought of what he wants and needs to preserve before it is too late. "Once changed, the wilderness cannot be legislated back into existence."

Since this book deserves a wide circulation even beyond our shores, it should have added the internationally recognizable scientific names of all the creatures mentioned therein, even if only in the form of an appendix.

ADDITIONAL NOTES ON THE ERIOCAULACEAE. XXIX

Harold N. Moldenke

ERIOCAULON SOLIYANUM Royle

Additional bibliography: Steud., Nom. Bot., ed. 2, 1: 586. 1840; Moldenke, Phytologia 19: 418--420. 1970.

Steudel (1840) reduces E. trilobum Hamilt. to the synonymy of E. quinquangulare L.

ERIOCAULON SPARGANIOIDES Bong.

Emended synonymy: Eriocaulon sparganoides Bong. ex Steud., Syn. Pl. Glum. 2: [Cyp.] 334, sphalm. 1855.

Additional & emended bibliography: Bong., Ess. Monog. Erioc. 37. 1831; Steud., Nom. Bot., ed. 2, 1: 586. 1840; Kunth, Enum. Pl. 3: 579--580 & 614. 1841; D. Dietr., Syn. Pl. 5: 268. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 283 & 334. 1855; Moldenke, Phytologia 19: 424. 1970.

ERIOCAULON SPHAGNICOLA Ohwi

Additional bibliography: Moldenke, Phytologia 19: 424. 1970.

Illustrations: Satake in Nakai & Honda, Nov. Fl. Jap. 6: 64, fig. 30. 1940; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] fig. 17. 1940.

The type of this endemic species was collected by Jisaburo Ohwi (no. 2843) at Kanjan-muri, in Kanhoku province, Korean and is deposited in the herbarium of the University of Tokyo. The only vernacular name recorded for it is "koke-hosikusa". The so-called "correction" of the original spelling of the specific epithet of this taxon was unjustified because Latin words ending in -icola are indeclinable.

ERIOCAULON SPONGIOSIFOLIUM Alv. Silv.

Synonymy: Eriocaulon spongiosum Alv. Silv., Fl. Mont. 1: 19 & 398. 1928.

Bibliography: Alv. Silv., Arch. Mus. Nac. Rio Jan. 23: 161. 1921; Alv. Silv., Fl. Mont. 1: 16--17, 19, & 398, pl. 4. 1928; A. W. Hill, Ind. Kew. Suppl. 7: 89. 1929; Moldenke, Known Geogr. Distrib. Erioc. 8 & 40. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 77 & 206. 1949; Moldenke, Résumé 89, 293, & 483. 1959.

Illustrations: Alv. Silv., Fl. Mont. 1: pl. 4. 1928.

Under E. spongiosum Silveira cites A. Silveira 424 from Rio Clara, São Paulo, Brazil, collected in 1888, and this is apparently the type on which both binomials are based.

ERIOCAULON SPRUCEANUM Körn.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 488--489. 1863; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 879. 1893; Ruhl.

in Engl., Pflanzenreich 13 (4-30): 43, 54, & 287. 1903; Herzog in Fedde, Repert. Sp. Nov. 29: 203--204. 1931; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 879. 1946; Moldenke, Known Geogr. Distrib. Erioc. 5, 8, & 40. 1946; Moldenke, Alph. List Cit. 2: 609. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 60, 77, & 206. 1949; Moldenke, Phytologia 3: 399. 1950; Moldenke, Résumé 66, 89, & 483. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 879. 1960; Moldenke, Phytologia 18: 342. 1969.

Körnigke, in his original description (1863), states that the leaves of this species are 12--30 cm. long and the scapes 20--30 cm. long, equaling or shorter than the leaves. The type apparently is Spruce 2607, from Panuri on the Rio Uaupés, Amazonas, Brazil. Recent collectors describe the flower-buds as white and found the plant growing in the water or on rocks in rapids, on sandy savannas, and on boulders with Podostemon, at altitudes of 700 to 2100 feet, flowering in June, September, and November. The vernacular name, "wów-wee-ree", is recorded for it. The Killip 34260, previously cited as this, is actually f. viviparum Moldenke.

Citations: COLOMBIA: Vaupés: P. H. Allen 3079 (W--1951945); Schultes, Baker, & Cabrera 18555 (Ss, W--2113114, W--2172200); Schultes & Cabrera 17314 (W--2171879), 17595 (N, Ss, W--2171953, Z), 19637 (Ss, W--2172463), 19907 (Ss). BRAZIL: Amazonas: Spruce 2607 [Macbride photos 25159] (B--isotype, Br--type, N--isotype, N--photo of isotype).

ERIOCAULON SPRUCEANUM f. AMPHIBIUM Herzog

Synonymy: Eriocaulon spruceanum f. amphibia Herzog in Fedde, Repert. Sp. Nov. 29: 203--204. 1931.

Bibliography: Herzog in Fedde, Repert. Sp. Nov. 29: 203--204. 1931; Moldenke, Known Geogr. Distrib. Erioc. 8 & 40. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 77 & 206. 1949; Moldenke, Phytologia 3: 399. 1950; Moldenke, Résumé 89 & 483. 1959.

This form was originally published as "amphibia" in accord with Herzog's policy of having all subspecific epithets agree in their gender with the words "varietas" or "forma" rather than the generic name. The form is based on Luetzelburg 22796, 23007, 23017, 23870, and 23882, all from Papari, Alto Amazonas, Amazonas, Brazil -- 22796 being from Cururú, 23007 & 23017 from Cupim, 23870 from Janareté, and 23882 from Yapá. Luetzelburg reports that it grows in the water of waterfalls with plants of the Podostemonaceae and that its flowers are grayish-white when fresh.

Citations: BRAZIL: Amazonas: Luetzelburg 22796 (Mu--cotype), 23007 (Mu--cotype), 23017 (Mu--cotype), 23177 (Mu), 23870 (Mu--cotype), 23882 (Mu--cotype).

ERIOCAULON SPRUCEANUM f. FLUITANS Herzog

Bibliography: Herzog in Fedde, Repert. Sp. Nov. 29: 203--204. 1931; Moldenke, Known Geogr. Distrib. Erioc. 8 & 40. 1946; Molden-

ke, Known Geogr. Distrib. Verbenac., [ed. 2], 77 & 206. 1949; Moldenke, Phytologia 3: 399. 1950; Moldenke, Résumé 89 & 483. 1959.

Herzog (1931) says "Die f. fluitans entspricht der Beschreibung Ruhland's um 'Pflanzenreich' (S. 54) vollkommen. Das hier im Bestimmungsschlüssel verwendete Merkmal der die Blütschäfte an Länge übertreffenden oder erreichenden Blätter kann aber nur auf diese flutenden, ausgesprochenen Wasserformen bezogen werden. Bei den Zeitweilig trockengestellten Pflanzen, die ich als f. amphibia unterschieden habe, sind die Blätter wesentlich kürzer, bei n. 23882 werden sie sogar von den Schäften um das 3—4-fache an Länge übertroffen. Diese aus das obere Rio Negrogebiet beschränkte Art kommt also in mehreren von den Natur ihres Standortes abhängigen und habituell recht verschiedenen Formen vor, wie dies ja auch von anderen amphibischen Pflanzen zur Gemüge bekannt ist. Es wäre darauf bei der Bestimmung kurzblättrigen Formen zu achten, die nur nach ihrem Blütenbau sicher erkannt worden können."

The form is apparently based on Luetzelburg 23251 and 23257, the labels of which indicate that they were collected in northern Brazil at Cururu, Cachoeira, Uaupes, on granite rock in the waterfalls, flowering and fruiting in November. It is probable that these localities are in Pará, Brazil.

Citations: BRAZIL: Pará: Luetzelburg 23251 (Mu—cotype), 23257 (Mu—cotype).

ERIOCAULON SPRUCEANUM f. VIVIPARUM Moldenke

Bibliography: Moldenke, Phytologia 3: 399 (1950) and 18: 342. 1969.

Collectors describe this plant as a semi-aquatic growing in very wet places or under water of small streams in dense forests or on savannas, forming rosettes, at altitudes of 235 to 700 meters, flowering and fruiting from January to March. The Killip collection cited below was previously cited by me (1950) as typical E. spruceanum Körn., but is better placed here.

Citations: COLOMBIA: Méta: Killip 34260 (N, S). Vaupés: Garcia Barriga & Jaramillo Mejia 17096 (N—type, Z--isotype), 17128 (N).

ERIOCAULON STEINBACHII (Moldenke) Moldenke

Synonymy: Paepalanthus steinbachii Moldenke, Phytologia 2: 231—232. 1947.

Bibliography: Moldenke, Phytologia 2: 231—232 & 364—365. 1947; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 96 & 206. 1949; Moldenke, Phytologia 3: 399. 1950; E. J. Salisb., Ind. Kew. Suppl. 11: 88. 1953.

ERIOCAULON STELLULATUM Körn.

Synonymy: Eriocaulon stellulatum Koen. ex Razi, Journ. Mysore Univ. 11 (1): 6, sphalm. 1950.

Bibliography: Körn., Linnaea 27: 620. 1854; C. Müll, in Walp., Ann. 5: 926 & 935 (1860) and 6: 1171. 1861; Körn. in Mart., Fl. Bras. 3 (1): 475. 1863; Hook. f., Fl. Brit. Ind. 6: 579. 1893;

Maxim., Diagn. Pl. Nov. Asiat. 8: 8. 1893; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 879. 1893; Ruhl. in Engl., Pflanzenreich 13 (4-30): 65, 97, & 287. 1903; Fyson, Journ. Indian Bot. 2: 317. 1921; C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. 1, 9: 1606 & 1618. 1931; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 879. 1946; Razi, Journ. Mysore Univ. 7 (4): 77. 1946; Moldenke, Known Geogr. Distrib. Erioc. 24 & 40. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 125, 127, & 206. 1949; Razi, Journ. Mysore Univ. 11 (1): 6. 1950; Moldenke, Phytologia 3: 399-400. 1950; C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. 2, 8 [3]: 1120, 1126, & 1333. 1956; Moldenke, Résumé 159, 162, 178, & 483. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 879. 1960; Moldenke, Résumé Suppl. 2: 6 & 15. 1960; Moldenke, Biol. Abstr. 35: 2177. 1960; Hocking, Excerpt. Bot. A. 4: 593. 1962; Thanikaimoni, Pollen & Spores 7: 186. 1965; Moldenke, Phytologia 17: 383 (1968), 18: 53 (1968), and 19: 334. 1970.

Fyson (1921) describes this species as "Leaves broad and thin 2-3 in. acute. Scapes several slender 3-6 in. Heads 1/3 in. Involucral bracts lanceolate-acute, reflexed. Floral similar, spreading, much longer than the flowers, making the head a glistening stellate globe. Female sepals 2, strongly crested on the back; petals 3, oblanceolate, very hairy. Male flowers normal, 3-merous. Bombay and Malabar; on the western Ghats. Abundant on lake side at Mahabaleshwar in Oct. (Sedgwick)." Razi (1950) lists "E. wallichiana ?" as a possible synonym, but that binomial belongs in the synonymy of E. sexangulare L. Bunnak reports the plant as "a common herb with white flowers in damp places" and "herb common in savannas" in Thailand, where it is known as "chuk nok yung". Bole describes it as an herb 2-4 inches tall, with white heads, and says that it is "very common" in Bombay. It has been collected at altitudes of 130 to 666 meters, flowering in September and October, fruiting in October.

The Fyson 3819, distributed as E. stellulatum, is actually E. dianae var. longibracteatum Fyson. Ritchie 1242 is a mixture with E. achiton Körn. and E. thwaitesii Körn.

Additional citations: INDIA: Bombay: P. V. Bole 300 (Xa), 1184 (Xa), 1204 (Xa); Meebold 9894 (S); Santapau 11744 (Xa), 11857 (Xa), 11858 (Xa), 11861 (Xa). Mysore: Herb. Presid. Coll. Madras s.n. [Anatpure, 21 October 1926] (S); Hugel 2127 (B-isotype, Mu-256-isotype); Stocks, Law & c. 27 (B). State undetermined: Ritchie 1242, in part (T). THAILAND: Bunnak 219 [Herb. Roy. Forest Dept. 9516] (Z), 571c [Herb. Roy. Forest Dept. 18265] (Bk).

ERIOCAULON STELLULATUM var. LAOSENSE Moldenke

Bibliography: Moldenke, Phytologia 7: 119. 1960; Moldenke, Biol. Abstr. 35: 2177. 1960; Moldenke, Résumé Suppl. 2: 6 & 15. 1960; Hocking, Excerpt. Bot. A. 4: 593. 1962.

Citations: INDOCHINA: Laos: Poillane 28225 bis (Mg--type, Z--isotype).

ERIOCAULON STENOPHYLLUM R. E. Fr.

Bibliography: R. E. Fr., *Wiss. Ergebn. Schwed. Rhod.-Kong.-Exped.* 1911-12 Bot. 1: 218, pl. 16. 1916; A. W. Hill, *Ind. Kew. Suppl.* 6: 79. 1926; Stapf, *Ind. Lond.* 3: 91. 1930; Moldenke, *Résumé* 148 & 483. 1969.

Illustrations: R. E. Fr., *Wiss. Ergebn. Schwed. Rhod.-Kong.-Exped.* 1911-12 Bot. 1: pl. 16. 1916.

The type of this species was collected in Zambia, where the species appears to be endemic.

ERIOCAULON STEYERMARKII Moldenke

Bibliography: Moldenke, *Alph. List Cit.* 2: 461 & 530 (1948) and 3: 975. 1949; Moldenke, *Known Geogr. Distrib. Verbenac.*, [ed. 2], 63, 67, & 206. 1949; Moldenke, *Phytologia* 3: 400. 1950; Moldenke, *Fieldiana* 28: 117--118. 1951; J. A. Steyer., *Fieldiana* 28: 1157. 1957; Moldenke, *Résumé* 71, 75, 77, & 483. 1959; G. Taylor, *Ind. Kew. Suppl.* 12: 55. 1959; J. A. Steyer., *Act. Bot. Venez.* 1: 195. 1966.

Recent collectors describe this plant as a submerged or emerged aquatic herb with pale-green flaccid leaves and white heads, the involucre blackish, found in moist places under overhanging cliffs, in water, in swampy depressions in wet savannas, in shallow open streams in savannas, and in bordering swales along rivers in scrub forests, at altitudes of 1200 to 2600 meters, flowering and fruiting in February and March. Maguire & Fanshawe refer to it as "frequent" in Guyana, while Steyermark & Wurdack refer to it as "frequent" or "locally frequent" in Bolívar, Venezuela.

Additional citations: VENEZUELA: Bolívar: B. Maguire 33512a (N); Steyermark & Wurdack 341 (Mu, N), 763 (N); Vareschi & Maegdefrau 6942 (Ve--42507, Ve--42908). GUYANA: Maguire & Fanshawe 33182 (N).

ERIOCAULON STOLONIFERUM Welw.

Synonymy: Eriocaulon stoloniferum "Welw. ex Rendle" apud H. Hess, *Bericht. Schweiz. Bot. Gesell.* 65: 147. 1955.

Bibliography: Rendle, *Cat. Afr. Pl. Welw.* 2: 101--102. 1899; Fritsch, *Bull. Herb. Boiss.*, sér. 2, 1: 1105. 1901; Ruhl. in *Engl., Pflanzenreich* 13 (4-30): 65, 97, & 287. 1903; Thiseit.-Dyer, *Ind. Kew. Suppl.* 2: 70. 1904; Moldenke, *Known Geogr. Distrib. Erioc.* 22 & 40. 1946; Moldenke, *Known Geogr. Distrib. Verbenac.*, [ed. 2], 118 & 206. 1949; H. Hess, *Bericht. Schweiz. Bot. Gesell.* 65: 147--150, fig. 1 & 2, pl. 8, fig. 6. 1955; Moldenke, *Résumé* 147 & 483. 1959; Moldenke, *Phytologia* 19: 16 & 73 (1969) and 19: 345. 1970.

Illustrations: H. Hess, *Bericht. Schweiz. Bot. Gesell.* 65: 148, fig. 1 & 2, pl. 8, fig. 6. 1955.

Rendle (1899) says of this plant: "A perennial entirely submerged herb, with flower-heads just emerging when mature. Plentiful in cold rather rapidly flowing mountain streams at Morro de Lopollo, but somewhat rarely flowering. Forms a widely spreading

very green carpet beneath the water. A few fruiting specimens in Dec. 1859; in middle of May 1860. No. 2458." He also says of it "Near E. rivulare Don, but distinguished by its narrow leaves, larger flowers with glabrous sepals, etc."

Hess (1955) tells us that "Im Gebiet des locus classicus wurden etwa 50 Exemplare dieser Art gesammelt. Um die Bestimmung zu sichern, sandte man mir von der Universidade Lisboa das Typus-Material dieser Art. Es wurde von Welwitsch bei Huila (Morro de Lopollo) unter Nr. 2458 im Mai 1860 gesammelt. Der Bogen ist von Welwitsch eigenhändig beschriftet. Weiter habe ich aus dem Muséum National d'Histoire Naturelle, Paris, einen Bogen mit einer unbestimmten Eriocaulaceae zugestellt erhalten, die von H. Humbert an einen gleichen Standort, ebenfalls in der Umgebung von Huila, gesammelt wurde. Diese Pflanzen sind gut entwickelt und sind mit dem Typus von Eriocaulon stoloniferum identisch....Bereits Brown (1901) hat die Fehler in der Original-Diagnose von Rendle korrigiert (Rendle schrieb, die Sepalen der ♀ Blüten seien kahl und die Antheren 'dark')"

Hess cites H. Hess 52/1844 and Humbert 16680 from Huila, Angola. He continues: "Eriocaulon stoloniferum wächst in den Gebirgsbächen um Huila. Auf Sand- und Schlammhängen bildet die Pflanze submers dichte Rasen im 10--20 cm tiefen, schnell fließenden Wasser. Während der ersten Entwicklung sind auch die Blütenköpfe untergetaucht, später ragen diese aus dem Wasser. Die Art gedeiht besonders gut unter mächtigen und überhängenden Horsten von Gramineen oder im Schatten von Sträuchern und Bäumen.....Das ganze Material ist einheitlich. Welwitsch bemerkt auf der Etikette unter dem Fundort: 'Sed rarius florens, pauca specim. fructiferum Decemb. 1859'....Die Art nur aus der Umgebung von Huila bekannt....Auf die morphologische Verwandtschaft von Eriocaulon stoloniferum mit E. Woodii N. E. Br. hat Brown (1901) hingewiesen, ist dabei aber nicht auf die trennenden Merkmale eingegangen. Ruhland (1903) hat diese Tatsache ganz verkannt und E. stoloniferum neben der australischen E. lividum F. Mueller untergebracht. Diese Arten stehen morphologisch weit auseinander.

"Von Eriocaulon Woodii konnte ich ein umfangreiches Material aus dem Botanischen Museum der Universität Zürich untersuchen. Davon wurden zwei Bogen von J. M. Wood 1909 bei Durban und 1910 bei Rheenens in Natal gesammelt. Weitere vier Bogen liegen von H. Rudatis vor, der die Pflanzen unter Nr. 1420 am 20.6.1911 in Natal, im Ifofa-Tal, auf ca. 500 m Höhe sammelte. Alle Proben stammen von Bachufern oder aus Bächen, wo die Blattrosetten untergetaucht waren. Die Blätter von E. Woodii sind auch an den untergetauchten vollentwickelten Exemplaren nur bis etwa 7 cm lang und 2 mm breit. Sie sind stumpf unter nur ganz kurz zugespitzt. Dies scheint das einzige Merkmal zu sein, um E. Woodii von E. stoloniferum zu unterscheiden. Habituell stimmen die Arten sonst überein. In den Blüten sind nur unbedeutende Unterschiede zu finden: Die drei Sepalen der ♀ Blüten von E. Woodii sind fast gleich groß; sie sind tiefer konkav als bei E. stolon-

iferum und oft helmförmig entwickelt. Die Zähne an der Spitze sind weniger grob und die Behaarung auf dem Rücken ist dichter als bei E. stoloniferum. Die Petalen der beiden Arten stimmen überein. Der Blütenboden ist bei beiden Arten kahl....Eriocaulon Woodii und E. stoloniferum stellen gleiche Ansprüche an den Standort.

"Etwas anders verhält es sich mit dem Original-Material von Eriocaulon Woodii aus dem Herbarium Kew, das nach brieflicher Mitteilung von Herrn Milne-Redhead als authentisch zu betrachten ist. Es wurde von Hutchinson und Gilett unter Nr. 4324 in Nord-Rhodesien gesammelt. Die Blätter an diesen Pflanzen sind bis 25 cm lang und allmählich zugespitzt. Sie sind also denen von E. stoloniferum ähnlich, sind aber derber. In den Blütenköpfen sind die Früchte noch unentwickelt, und auch die Antheren sind noch von den Sepalen umgeben. Die Sepalen der Blüten lassen sich noch flach ausbreiten oder sind nur wenig konkav. Sie haben die bereits angegebene Behaarung und Zähmung an der Spitze. Ob es sich bei diesen Pflanzen um E. Woodii oder E. stoloniferum handelt, kann nicht entschieden werden. Brown (1897) schreibt über E. Woodii, die Sepalen der ♀ Blüten seien u. a. flach oder nur wenig konkav; es ist möglich, dass Brown auch nur Material mit unreifen Früchten untersucht hat. Die Größenumterschiede in den Sepalen zwischen E. Woodii und E. stoloniferum, die Brown angibt, sind nicht vorhanden. Leider leiht Kew das Typus-Material von E. Woodii nicht aus, sonst wäre es wahrscheinlich möglich, festzustellen, ob E. stoloniferum Welw. ex Rendle ein Synonym des um 2 Jahre älteren Namens E. Woodii ist. Die Varietät minor Ruhl. wäre dann als eigene Art aufzufassen und mit neuem Namen zu versehen."

Mr. Meikle is of the opinion that E. stoloniferum is conspecific with E. antunesii Engl. & Ruhl., but, according to a letter to me from E. Milne-Redhead, dated June 12, 1969, this decision was reached without comparison with the type collection of the latter species.

Eriocaulon stoloniferum has been collected at altitudes of 1850—1870 meters.

Citations: ANGOLA: Huila: H. Hess 52/1844 (B, Z); Welwitsch 2458 (B—istotype, Mu—istotype, Mu—istotype, Mu—istotype).

ERIOCAULON STRAMINEUM Körn.

Synonymy: Eriocaulon anceps Körn., in herb. [not E. anceps Sessé & Moc., 1893, nor Walt., 1788].

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 478. 1863; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 879. 1893; Ruhl. in Engl., Pflanzenreich 13 (4-30): 32, 37, & 287. 1903; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 879. 1946; Moldenke, Known Geogr. Distrib. Erioc. 8 & 40. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 77 & 206. 1949; Moldenke, Résumé 89, 112, & 483. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3,

1: 879. 1960; Moldenke, Phytologia 18: 363 (1969) and 19: 337. 1970.

The E. anceps credited to Sessé & Mociffo and referred to in the synonymy above is a synonym of E. ehrenbergianum Klotzsch, while the homonym credited to Walter is Lachnocaulon anceps (Walt.) Morong. Körnicke's E. anceps appears to be based on the same collection which is the type of E. stramineum, viz., Weddell 2130, and is probably a name he first intended to use and later discarded because it was preoccupied.

Material of E. stramineum has been misidentified and distributed in herbaria as E. guyanense Körn. On the other hand, the Wallich 6069, distributed as E. stramineum, is actually the type collection of E. oryzetorum Mart.

Collectors have found E. stramineum in flower and fruit in September.

Citations: BRAZIL: Goiás: Weddell 2130 (B--isotype, Br--isotype, N--photo of isotype, Z--photo of isotype). Maranhão: Murça Pires & Black 2538 (N). Marajo Island: V. C. de Miranda 3072 (S, Ut--1641).

ERIOCAULON STRIATUM Lam.

Synonymy: Eriocaulon stupeum J. Sm. in Rees, Cyclop. 13: Eriocaulon. 1809. Eriocaulon borbonicum Willd. ex Kunth, Enum. Pl. 3: 560--561. 1841. Eriocaulon striatum Körn. apud Benth. & Hook. f., Gen. Pl. 3 (2): 1021, sphalm. 1883.

Bibliography: Lam., Encycl. Méth. Bot. 3: 275. 1789; Lam., Tabl. Encycl. [Ill.] 1: 213, pl. 50, fig. 1. 1791; J. Sm. in Rees, Cyclop. 13: Eriocaulon. 1809; Roem. & Schult. in L., Syst. Veg., ed. 15 nova, 2: 863. 1817; Steud., Nom. Bot. Phan., ed. 1, 313. 1821; Poir. in Cuvier, Dict. Sci. Nat. 24: 239--240. 1822; Steud., Nom. Bot., ed. 2, 1: 586. 1840; Kunth, Enum. Pl. 3: 560--561, 612, & 614. 1841; D. Dietr., Syn. Pl. 5: 264--265. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 272, 333, & 334. 1855; Körn., Linnaea 27: 272. 1856; C. Müll. in Walp., Ann. 5: 926 & 940--941 (1860) and 6: 1141 & 1170. 1861; Benth. & Hook. f., Gen. Pl. 3 (2): 1021. 1883; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 25. 1888; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 877 & 879. 1893; Ruhl. in Engl., Bot. Jahrb. 27: 67, 70, & 77. 1899; Britten, Journ. Bot. 38: 482 & 483. 1900; Fritsch, Bull. Herb. Boiss., sér. 2, 1: 1102--1104. 1901; Ruhl. in Engl., Pflanzenreich 13 (4-30): 63, 79, 285, & 287. 1903; H. Lecomte, Bull. Soc. Bot. France 55: 571. 1908; Stapf, Ind. Lond. 3: 91. 1930; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 877 & 879. 1946; Moldenke, Known Geogr. Distrib. Erioc. 22, 33, & 40. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 123, 124, & 206. 1949; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 141. 1955; Moldenke in Humbert, Fl. Madag. 36: 26--27. 1955; Moldenke, Résumé 156--158, 286, 293, & 483. 1959; Straka, Erdkunde 14: 90. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., pr.

3, 1: 877 & 879. 1960; Moldenke, *Phytologia* 18: 389--391. 1969.

Illustrations: Lam., *Tabl. Encycl. [Ill.]* 1: 213, pl. 50, fig. 1. 1791.

Acaulescent herb, probably perennial; rhizome many-branched, sordid-lanuginous between the leaves at the apex; leaves ensiform-linear, membranous, green, 5--6.5 cm. long, 2--4 mm. wide, flat, slightly surpassing the sheaths, acute at the apex, scarcely pellucid, lightly fenestrate-many-veined, mostly 9--13-veined, glabrous; sheaths rather close or loose, membranous or thin-membranous, greenish-stramineous, 2.4--6.4 cm. long, glabrous, acuminate or acute at the apex and there wide-open and loose; peduncles 9--20 cm. long, eventually spirally twisted; heads hemispheric, white-villous, about the size of a pea; involucrel bractlets obovate, grayish, much shorter than the disk, rounded at the apex, glabrous; receptacle pilose; receptacular bractlets spatulate-cuneate or subrhomboid-cuneate, olivaceous-gray, acuminate at the apex, white-pilose with rather thick opaque hairs on the outside toward the apex; staminate florets: long-pedicellate, slightly surpassing the receptacular bractlets; sepals 3, separate, obovate-spatulate or -cuneate, plumbeous-gray or olivaceous-gray, rather acutish and white-pilose with rather thick opaque hairs at the apex, cucullate-coherent on the back but easily separating, the 2 lateral ones carinate-navicular, the posterior one slightly narrower and flatter; petals 3, connate below, the tube slender and solid, somewhat ampliate above, glabrous, its limb bilabiate-trifid, the lobes obtuse at the apex, pilose-ciliate at the apex, with a sessile black linear-oblong gland above the middle and below the apex within, the anterior lobe oblong, the posterior ones much smaller and narrowly oblong; stamens 6 (rarely 4), inserted at the top of the corolla-tube, 3 alternate with the corolla-lobes, the other 3 opposite the lobes and adnate to their base, the 2 opposite the smaller lobes sometimes obsolete; anthers didymous-subrotund, olivaceous-black; pistil-rudiments 2 or 3, sessile in the center of the top of the corolla-tube, subglobose-clavate or subconic, black; pistillate florets: short-pedicellate; sepals approximate beneath the ovary, subspatulate, sordid olivaceous-gray or plumbeous-gray, acute at the apex, broadly navicular-carinate, white-pilose above, the posterior one slightly narrower and flatter; petals 3, very remote from the sepals, linear- or lanceolate-spatulate, white or whitish, rather thick-textured, equaling the sepals in length, pilose toward the tip within, black-glanduliferous with an oblong gland beneath the apex, the anterior petal slightly larger; ovary sessile, ovate, 3-celled; style rather long or short; stigmas 3, elongate, capillary, simple; fruit depressed-globose, membranous, brown, 3-seeded, crowned with the persistent style and stigmas, dehiscing longitudinally; seeds subglobose-elliptic, ferruginous, rounded at both ends, with a punctiform tubercle at the hilum, densely white-pulverulent with minute obtuse hyaline hair-like cellular outgrowths, longitudinally rugose when young.

The type of this species was collected by Bory de St. Vincent

on the island of Réunion and is deposited in the herbarium of the Muséum National d'Histoire Naturelle in Paris. The type of E. borbonicum is Herb. Willdenow 2357, also from Réunion and also collected by Bory de St. Vincent; it may well be the Herb. Kunth s.n. specimen cited below from the herbarium of the Botanisches Museum at Berlin, and of which Kunth (1841) says "Differt ab E. striato praesertim sepalis masculis exterioribus postice cohaerentibus; fructus illius haud suppetunt". Steudel (1821, 1840) reduces E. striatum to the synonymy of E. quinquangulare L.

In Humbert's Fl. Madag. (1955) the date of publication for the name E. stupeum is given as "1890" instead of "1809" and the date of Lamarck's illustration of E. striatum is given as "1789" instead of "1791".

The species has been found growing on riverbanks and in ravines, flowering and fruiting in July. The initial letter of the specific epithet is uppercased by Müller (1860). A common name recorded for the species is "joncinelle canche". The Pourret s. n. collection, cited below, was originally identified as Statice maderaspatana Pluk. "t. 21 f. 7", but that name belongs in the synonymy of E. quinquangulare L.

Citations: MADAGASCAR: K. R. Afzelius s.n. [Tamatave, 26.7. 1912] (S); Thouin 12 (S). MASCARENE ISLANDS: Mauritius: Commer-son s.n. [ile de france] (N, P). RÉUNION: Boivin 1019 (P); Bory de St. Vincent s.n. [isle bourbon; herb. Poiret] (N--photo of type, P--type, Z--photo of type); Commerson s.n. [isle de bourbon] (N, P); Decken s.n. [Bourbon] (B); Delessert s.n. (V--86951); Frapplier 181 (P); Geay 9182 (P); Herb. Kunth s.n. [Insula Borboniae] (B); L'Isle 112 (P); Pourret s.n. (P); Richard 583 (P).

ERIOCAULON STRICTUM Milne-Redhead

Bibliography: Milne-Redhead in Hook., Icon. Pl. 34: pl. 3388. 1939; Moldenke, Known Geogr. Distrib. Erioc. 21. 1946; Hill & Salisb., Ind. Kew. Suppl. 10: 86. 1947; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 117 & 206. 1949; Moldenke, Phytologia 3: 400. 1950; Moldenke, Résumé 144, 149, & 483. 1959; Moldenke, Résumé Suppl. 2: 6. 1960.

Illustrations: Milne-Redhead in Hook., Icon. Pl. 34: pl. 3388. 1939.

Collectors describe this plant as a slender erect annual, the leaves green, few, in a basal rosette, 3-veined, with pellucid veins and pellucid papillose margins; the inflorescence spherical; the sheaths and scapes pale-green; the bractlets very pale grayish-biscuit-color; and the flowers blackish. They have found it growing in swamps and "dambo", in flat riverside recently swamped meadows, and on the alluvium of the Niger River in inundated prairies, at 4000 feet altitude, flowering and fruiting in January, April to June, and December. Milne-Redhead & Taylor found it in damp sandy ground between grass tussocks near the edge of secon-

dary Brachystegia-Uapaca woodlands and boggy grasslands.

Raynal & Raynal 5306 bis is said, according to the collectors' notes, to be identical with Herb. Centre Recherche Zootechniques 1339 and with Raynal 5218 ter & 5229, not as yet seen by me. The Robinson specimens in the Munich herbarium were identified there as E. strictum and seem to agree well with the other material cited here and with the original illustration of this species. However, several letters to me from the Royal Botanic Gardens at Kew on this matter are certainly very relevant. A letter, dated July 4, 1969, from Sir George Taylor, but signed by J. P. M. Brennan, says "With reference to the enquiry in your letter of June 2nd, our material of E. A. Robinson 6827 from Zambia has not been identified, but it is unquestionably an Eriocaulon species, clearly allied to, and perhaps not specifically distinct from your Eriocaulon inundatum. Until the material has been critically examined, it is impossible to give you a precise report on its identity, but I am satisfied that it is not a Syngonanthus."

This was followed, on July 30, 1969, by a letter from Brennan, but signed by E. Milne-Redhead, saying "I am surprised to read that the workers on the Flora of South-West Africa at Munich have identified E. A. Robinson 6827 as Eriocaulon strictum Milne-Redhead, and feel that there must be an error somewhere, possibly because this particular number is a mixed gathering. The Kew specimen is certainly not E. strictum."

Citations: MALI: Soudan: Raynal & Raynal 5306 bis (Z). TANZANIA: Tanganyika: Milne-Redhead & Taylor 9939 (B, S, Z). ZAMBIA: E. A. Robinson 2241 (Mu), 2852 (Mu), 6827, in part (Mu, N). RHODESIA: Brain 3781 (N).

ERIOCAULON STUHLMANNI N. E. Br.

Synonymy: Eriocaulon stuhlmannii N. E. Br. apud H. Lecomte, Fl. Gén. Indo-Chine 7: 14, sphalm. 1912.

Bibliography: N. E. Br. in Thiselt.-Dyer, Fl. Trop. Afr. 8: 255. 1901; Ruhl. in Engl., Pflanzenreich 13 (4-30): 111 & 287. 1903; Prain, Ind. Kew. Suppl. 3: 70. 1908; H. Lecomte, Fl. Gén. Indo-Chine 7: 14. 1914; Moldenke, Résumé 293. 1959; Moldenke, Résumé Suppl. 1: 9 & 25 (1959), 3: 15 & 16 (1962), and 4: 6. 1962; Moldenke, Phytologia 17: 459 (1968), 19: 25 (1969), and 19: 328. 1970.

Ruhland (1903) reduced this species to synonymy under what is now called E. cinereum R. Br. and so annotated the Berlin isotype. Until recently I followed him in this disposition of the name, but after having seen the type collection and the other specimens cited below, now feel that this position is untenable.

Material has been misidentified and distributed in herbaria under the names E. heudelotii N. E. Br., E. sexangulare L., and E. sieboldianum Sieb. & Zucc.

Citations: SÉNÉGAL: Raynal & Raynal 6573 (Z). REPUBLIC OF GUINEA: Pitot 26 (An). TANZANIA: Tanganyika: Stuhlmann 3552 (B--

isotype, Z--isotype).

ERIOCAULON SUBGLAUCUM Ruhl.

Synonymy: Eriocaulon atratum Thwaites apud Ruhl. in Engl., Pflanzenreich 13 (4-30): 83 & 284, in syn. 1903 [not E. atratum Körn., 1856, nor Nakai, 1968]. Eriocaulon glaucum Körn. ex Moldenke, Résumé Suppl. 1: 17, in syn. 1959 [not E. glaucum Griff., 1851].

Bibliography: Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 1, 341. 1864; Hook. f. in Trimen, Handb. Fl. Ceylon 5: 3. 1900; Ruhl. in Engl., Pflanzenreich 13 (4-30): 60, 68, 83, 284, & 287. 1903; Prain, Ind. Kew. Suppl. 3: 70. 1908; Fyson, Journ. Indian Bot. 3: 18. 1922; Moldenke, Known Geogr. Distrib. Erioc. 24 & 40. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 130 & 206. 1949; Moldenke, Résumé 167, 286, 294, & 483. 1959; Moldenke, Résumé Suppl. 1: 17. 1959; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 2, 341. 1964; Moldenke, Phytologia 18: 99 & 172 (1969) and 19: 324 & 325. 1970.

The Eriocaulon atratum Körn., mentioned in the synonymy above, is a valid species, while the homonym accredited to Nakai is a synonym of E. atrum Nakai; E. glaucum Griff. is a valid species. The E. glaucum of Körnicke appears to be based on Thwaites C.P. 61 in the herbarium of the Botanisches Museum at Berlin -- the same specimen on which Ruhland's E. subglaucum is based. Thwaites & Hooker (1864) reduce E. atratum Körn. in part to E. sexangulare L. and in part to E. truncatum Hamilt. Hooker (1900) regarded E. atratum Thwaites as a synonym of E. ceylanicum Körn.

Eriocaulon subglaucum is apparently endemic to Ceylon, where it has been found at 7000 feet altitude.

Citations: CEYLON: Herb. Decaisne 3289 (Br); Thwaites C.P. 61 (B--type, Br--isotype, N--isotype, N--photo of type, Z--photo of isotype).

ERIOCAULON SUBMERSUM Welw.

Synonymy: Eriocaulon submersum "Welw. ex Rendle" apud H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 130. 1955.

Bibliography: Rendle, Cat. Afr. Pl. Welw. 2: 100--101. 1899; Fritsch, Bull. Herb. Boiss., sér. 2, 1: 1105. 1901; Ruhl. in Engl., Pflanzenreich 13 (4-30): 18, 64, 91, & 287. 1903; Thiselt.-Dyer, Ind. Kew. Suppl. 2: 70. 1904; J. M. Black, Fl. South. Austr. 3: 101. 1926; Alv. Silv., Ft. Mont. 1: 13. 1928; Moldenke, Known Geogr. Distrib. Erioc. 22 & 40. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 118 & 206. 1949; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 129--130, pl. 7, fig. 4. 1955; Moldenke, Résumé 147 & 483. 1959; Moldenke, Résumé Suppl. 16: 21. 1968; Moldenke, Phytologia 17: 456 (1968) and 18: 81. 1969.

Illustrations: H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 129, pl. 7, fig. 4. 1955.

Rendle (1899), quoting Welwitsch, describes the occurrence of

this species as "Here and there by a large pond near the banks of the river Mupanda. A few poor specimens collected during flight; Feb. 1860. No. 2456. Somewhat rare in gently flowing rather deep streams between Lopollo and Nene, flowering in autumn. Produces both flower and fruit beneath the water; end of April 1860. All the specimens seen grew at the bottom of a stream 2 to 3 ft. deep, and the plant thus seems to flower and fruit beneath the surface. On the muddy bottom of slowly flowing streams between Humpata and Lopollo, in one place only, but plentiful there; end of April 1860. No. 2457."

The Eriocaulon submersum Tate is a synonym of E. carsoni F. Muell.

Citations: ANGOLA: Huila: Welwitsch 2457 (B--cotype, Mu--cotype, Mu--cotype, Z--cotype).

ERIOCAULON SUBULATUM N. E. Br.

Bibliography: N. E. Br. in Thiselt.-Dyer, Fl. Trop. Afr. 8: 255. 1901; Ruhl. in Engl., Pflanzenreich 13 (4-30): 66, 100, & 287. 1903; Prain, Ind. Kew. Suppl. 3: 70. 1908; Marloth, Fl. S. Afr. 4: 66. 1915; Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Known Geogr. Distrib. Erioc. 22 & 40. 1946; J. Hutchinson, Botanist in South. Afr. 480. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 119, 120, & 206. 1949; Moldenke, Phytologia 3: 400. 1950; Wild, Victoria Falls Handb. 124. 1953; Moldenke in Humbert, Fl. Madag. 36: [7] & 10--11, fig. 1 (24--28). 1955; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 158--162. 1955; Moldenke, Résumé 148--150, 156, 293, & 483. 1959; Moldenke, Phytologia 18: 95, 97, & 98 (1969), 19: 43 (1969), and 19: 418 & 420. 1970.

Illustrations: Marloth, Fl. S. Afr. 4: 66. 1915; Moldenke in Humbert, Fl. Madag. 36: [7], fig. 1 (24--28). 1955.

The E. subulatum accredited to Bojer is a synonym of E. sollyanum Royle.

According to Perrier de la Bâthie, E. subulatum grows in "Tourbe humide et émergée; boues, mares plus ou moins profondes, vers 500 m. alt.; fl.: avril--août." Wild (1953) cites Engler s.n., Eyles 125, R. E. Fries 62, Gibbs 175, J. Hutchinson 3447, Keay s.n. [F. H. I. 21406], Keilhack s.n., Kirk s.n., Kolbe 3441, Rendle 380 & 381, and Rogers 5806 from Victoria Falls, Rhodesia. It seems rather difficult to believe that the Madagascar specimens cited below represent the same species as the one that is otherwise known only from Victoria Falls.

Drummond, on the label of R. B. Drummond 5597, avers that E. subulatum is only a form of E. gilgianum Ruhl. and that E. welwitschii Rendle may also be just another form of the same species. Hess (1955) actually unites E. subulatum with E. gilgianum under the latter name and gives detailed reasons for so doing [cfr. under E. gilgianum in these notes, Phytologia 18: 95].

Additional citations: RHODESIA: R. B. Drummond 5597 (S); Fries, Norlindh, & Weimarck 2750 (S); Keilhack s.n. [Victoria Fäll-

le des Sambesil] (B, B); Setchell & Setchell 31 (Ca--312745). MAD-AGASCAR: Perrier de la Bâthie 7248 (N, P), 7257 (N, P), 13760 (N, P).

ERIOCAULON SUISHAENSE Hayata

Synonymy: Eriocaulon suishaense Hayata apud A. W. Hill, Ind. Kew. Suppl. 7: 89. 1929. Eriocaulon suishaense var. okinawense Satake, Journ. Jap. Bot. 15: 141. 1939. Eriocaulon nigrum var. suishaense Hatuima & Koyama ex Hatusima, Mem. South. Indust. Sci. Inst. Kagoshima Univ. 3 (2): 123. 1962.

Bibliography: Hayata, Icon. Pl. Formos. 10: 55--56 & 272, fig. 31. 1921; Mak. & Nemoto, Fl. Jap., ed. 1, 1308. 1925; Sasaki, List Pl. Formos. 99. 1928; A. W. Hill, Ind. Kew. Suppl. 7: 89. 1929; Sasaki, Cat. Govt. Herb. 119. 1930; Mak. & Nemoto, Fl. Jap., ed. 2, 1515. 1931; Masamune, Short Fl. Formos. 263. 1936; Nemoto, Suppl. Fl. Jap. 1040. 1936; Satake, Journ. Jap. Bot. 15: 141. 1939; Satake in Nakai & Honda, Nov. Fl. Jap. 6: 6, 7, 9, 11, 12, 24, 78, & 87, fig. 1E, 2B, & 5E. 1940; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] 15--16, pl. 1, fig. 2. 1940; Moldenke, Known Geogr. Distrib. Erioc. 25 & 40. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 133, 140, & 206. 1949; Moldenke, Résumé 172, 181, 290, & 483. 1959; Hatusima, Mem. South. Indust. Sci. Inst. Kagoshima Univ. 3 (2): 123. 1962; Moldenke, Résumé Suppl. 17: 11. 1968.

Illustrations: Hayata, Icon. Pl. Formos. 10: fig. 31. 1921; Satake in Nakai & Honda, Nov. Fl. Jap. 6: 6, 7, & 11, fig. 1E, 2B, & 5E. 1940; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] pl. 1, fig. 2. 1940.

The type of this species was collected by Bunzô Hayata at Suisya, in the province of Taityu, Formosa, in April, 1916, and is deposited in the herbarium of the University of Tokyo. The species has been found at the edges of abandoned fields, and common names for it are "okinawa-mizutamaso" and "suisya-hosikusa".

Satake (1940) cites the following collections: RYUKYU ISLAND ARCHIPELAGO: OKINAWAN ISLANDS: Kosiki-zima: Kanasiro 1416 & 1616; Sakaguti s.n.; Tawada 781. Okinawa: Itô 1035; Kanasiro 501; Miyagi s.n.; Sakaguti 25 & s.n.. FORMOSA: Faurie 176, s.n. [Jun. 1903], & s.n. [May 1914]; Hayata s.n.; Kawakami s.n.; Kitamura 1356; Kudo & Sasaki 15631.

Citations: WESTERN PACIFIC ISLANDS: RYUKYU ISLAND ARCHIPELAGO: OKINAWAN ISLANDS: Kunigami: Walker, Tawada, & Amano 6458 (W--2093758). Okinawa: Kanashiro 2118 (W--2070828, 2).

ERIOCAULON SUMATRANUM Ruhl.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 64, 88, & 287. 1903; Prain, Ind. Kew. Suppl. 3: 70. 1908; Moldenke, Known Geogr. Distrib. Erioc. 27 & 40. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 143 & 206. 1949; Van Royen, Nov. Guin., new ser., 10: 35. 1959; Moldenke, Résumé 188 & 483. 1959; Molden-

ke, Phytologia 19: 85. 1969.

ERIOCAULON TAKAE Koidz.

Bibliography: Koidz. in Matsumura, Icon. Pl. Koisikav. 1: 157, pl. 79. 1913; Prain, Ind. Kew. Suppl. 5, pr. 1, 97. 1921; Mak. & Nemoto, Fl. Jap., ed. 1, 1308. 1925; Stapf, Ind. Lond. 3: 91. 1930; Mak. & Nemoto, Fl. Jap., ed. 2, 1515. 1931; Nemoto, Suppl. Fl. Jap. 1040. 1936; Honda, Nom. Pl. Jap. 463. 1939; Satake in Nakai & Honda, Nov. Fl. Jap. 6: 13, 44, 60, 79, & 87. 1940; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] 31--32, pl. 6, fig. 11. 1940; Moldenke, Known Geogr. Distrib. Erioc. 26 & 41. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 134 & 206. 1949; Moldenke, Résumé 173 & 483. 1959; Prain, Ind. Kew. Suppl. 5, pr. 2, 97. 1960; Koyama in Kitamura, Murata, & Koyama, Col. Illustr. Herb. Pl. Japan 3: 183 & 430. 1964.

Illustrations: Koidz. in Matsumura, Icon. Pl. Koisikav. 1: pl. 79. 1913; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] pl. 6, fig. 11. 1940.

The type of this species was collected by Gen-Iti Koidzumi on Mount Azuma-Takayama, in the province of Iwasiro, Honshu, Japan, in August, 1912, and is deposited in the herbarium of the University of Tokyo. Satake (1940) cites also Yuki 58811 from the same locality, where the species is said to be endemic and is known as "azuma-hosikusa". Satake says that it "Resembles Eriocaulon Miquelianum or E. hondoense, but is distinguished from both species in having thin calyx without the 2-celled clavate hairs, glabrous petals, and the narrow leaves".

ERIOCAULON TANAKAE Ruhl.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 64, 84, & 287. 1903; Prain, Ind. Kew. Suppl. 3: 70. 1908; Hand.-Mazz., Symb. Sin. 7: 1245. 1936; Satake in Nakai & Honda, Nov. Fl. Jap. 6: 1, 77, & 87. 1940; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] 64. 1940; Moldenke, Known Geogr. Distrib. Erioc. 26 & 41. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 134 & 206. 1949; Moldenke, Résumé 173 & 483. 1959.

Citations: JAPAN: Island undetermined: Tanaka s.n. [Comm. Navara] (B--isotype).

ERIOCAULON TAQUETII H. Lecomte

Bibliography: H. Lecomte, Not. Syst. 1: 192. 1910; Prain, Ind. Kew. Suppl. 4, pr. 1, 82 (1913) and pr. 2, 82. 1938; Satake in Nakai & Honda, Nov. Fl. Jap. 6: 57 & 87. 1940; Moldenke, Known Geogr. Distrib. Erioc. 25 & 41. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 133 & 206. 1949; Moldenke, Résumé 171 & 483. 1959.

Citations: KOREAN COASTAL ISLANDS: Quelpart: Taquet 1539 (B--isotype, Z--isotype). MOUNTED CLIPPINGS: original description (B).

ERIOCAULON TENUIFOLIUM Klotzsch

Synonymy: Eriocaulon tenifolium Klotzsch ex Moldenke in Maguire,

Mem. N. Y. Bot. Gard. 8: 97, sphalm. 1953. Eriocaulon tenuifolium Körn., in herb.

Bibliography: Klotzsch in Schomb., Faun. & Fl. Brit. Guian. 1116. 1848; C. Müll. in Walp., Ann. 5: 931 (1860) and 6: 1171. 1861; Körn. in Mart., Fl. Bras. 3 (1): 496 & 498. 1863; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 879. 1893; Ruhl. in Engl., Pflanzenreich 13 (4-30): 42, 50, & 287. 1903; Alv. Silv., Fl. Mont. 1: 398. 1928; Moldenke, Known Geogr. Distrib. Erioc. 6, 8, 41, & 60. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 879. 1946; Moldenke, Alph. List Cit. 3: 945 (1949) and 4: 1079 & 1132. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 63, 66, 77, & 206. 1949; Moldenke, Phytologia 3: 182 (1949) and 3: 400. 1950; Moldenke in Maguire, Mem. N. Y. Bot. Gard. 8: 97. 1953; Moldenke, Résumé 71, 75, 89, & 483. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 879. 1960; Moldenke, Phytologia 18: 188 (1969) and 19: 339 & 341. 1970.

Recent collectors describe this species as having white or chalky-white heads and as growing in damp patches in savannas or as being "locally abundant" or "frequent" in wet savannas, at altitudes of 120 to 200 meters, flowering and fruiting in January and October.

It should be pointed out that the Rob. Schomburgk 107 (in part) specimens cited below from the Berlin herbarium look very much like the rest of this collection in other herbaria which is the type collection of E. brevifolium Klotzsch [now known as E. klotzschii Moldenke] except that the heads are much larger. They match perfectly the cotype collections of E. tenuifolium and so I assume that a mixture in labeling took place. The two species are certainly closely related. The Berlin specimens were, in fact, originally identified by Ruhland as E. brevifolium, later changed by him to E. tenuifolium. Schomburgk 285, a cotype of E. tenuifolium, was photographed in the Delessert Herbarium at Geneva by Macbride as his type photograph number 25160. The other cotype collection is Rob. Schomburgk 448.

Since the first effective publication of the binomial, Eriocaulon tenuifolium Klotzsch, was a nomen nudum, the correct citation for this name is "Eriocaulon tenuifolium Klotzsch ex Schomb., Faun. & Fl. Brit. Guian. 1116, nom. nud. (1848); Körn. in Mart., Fl. Bras. 3 (1): 496. 1863".

Gleason, in his unpublished Flora of British Guiana, describes E. tenuifolium as follows: "Leaves cespitose, narrowly linear, 3--6 mm. wide, 1--2 (rarely 3) dm. long, lax, glabrous; peduncles 2--several, 3--6 dm. high, glabrous, striate, not twisted, their basal sheaths about equaling the leaves; heads whitish, subglobose, 5--8 mm. in diameter; bracts rhombic-ovate, the subtending bracts similar, the tip inflexed. On savannas, without definite locality, Schomburgk 285, 448, Loyed, Jenman 7279; Rupununi district, Jenman 5165; Roraima district, Quelch & McConnell 307, Loyed 18, Tate 3 (Endemic)". Silveira (1928) cites A. Silveira 619.

Material of this species has been misidentified and distributed in herbaria as E. atabapense Moldenke and E. humboldtii Kunth. On the other hand, the G. H. H. Tate 3, 267, & 329, distributed as E. tenuifolium by Gleason, are actually E. humboldtii Kunth. The A. C. Smith 2280, cited below, was previously regarded by me as E. atabapense and was so cited in error in previous installments of these notes.

Additional citations: VENEZUELA: Amazonas: Maguire, Cowan, & Wurdack 30984 (F, K, N, Ve, W); Maguire, Wurdack, & Keith 41890 (N, S, S). GUYANA: C. D. K. Cook 126 (S, S); Guppy 641 [Forest Dept. Br. Guian. 7656] (K, K, K); Little 16924 (Z); Rob. Schomburgk 107, in part (B), 285 [Macbride photos 25160] (N--photo of cotype, Z--photo of cotype), 448 (B--cotype); A. C. Smith 2280 (N, S). BRAZIL: Roraima: Prance, Steward, Ramos, & Farias 9177 (Ac, N).

ERIOCAULON TENUISSIMUM Nakai

Synonymy: Eriocaulon miquelianum Mori apud Satake in Nakai & Honda, Nov. Fl. Jap. 6: 59 & 87, in syn. 1940 [not E. miquelianum Auct. Jap., 1940, nor Koeck., 1933, nor Körn., 1867, nor Miyabe & Kudo, 1940, nor Miyabe & Tatew., 1940].

Bibliography: Nakai, Bot. Mag. Tokyo 31: 97. 1917; Mori, Enum. Pl. Corea 80. 1922; A. W. Hill, Ind. Kew. Suppl. 6: 79. 1926; Satake in Nakai & Honda, Nov. Fl. Jap. 6: 13, 58, 59, 80, & 87, fig. 27. 1940; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] 49--50, pl. 7, fig. 14. 1940; Moldenke, Known Geogr. Distrib. Erioc. 26 & 41. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 133 & 206. 1949; Moldenke, Résumé 171, 290, & 483. 1959; Moldenke, Phytologia 18: 182 & 311. 1969.

Illustrations: Satake in Nakai & Honda, Nov. Fl. Jap. 59, fig. 27. 1940; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] pl. 7, fig. 14. 1940.

The type of this species was collected by Takanoshin Nakai (no. 6118) in wet places by Tyozon, in the province of Kogen, Korea, and is deposited in the herbarium of the University of Tokyo. Satake (1940) says of this endemic species: "This species is characterized by the calyx of the female flower which has hairs on the outer side, broader petals, and densely haired bracts". He records the vernacular name "hoso-hosikusa" for it.

The E. miquelianum Körn., referred to in the synonymy above, is a valid species, with E. miquelianum Koeck. as a synonym, but the homonyms accredited to "Auct. Jap.", to Miyabe & Kudo, and to Miyabe & Tatewaki all belong in the synonymy of E. hondoense Satake.

ERIOCAULON TEPICANUM Moldenke

Bibliography: Moldenke, N. Am. Fl. 19 (1): 20 & 36. 1937; Moldenke, Phytologia 1: 327. 1939; Moldenke, Known Geogr. Distrib. Erioc. 4 & 41. 1946; Hill & Salisb., Ind. Kew. Suppl. 10: 86.

1947; Moldenke, Alph. List Cit. 3: 788. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 30 & 206. 1949; Moldenke, Résumé 36 & 483. 1959.

Additional citations: MEXICO: Nayarit: Edw. Palmer 2029 (S--isotype).

ERIOCAULON TEUSCZII Engl. & Ruhl.

Synonymy: Eriocaulon huillense Engl. & Ruhl. ex Ruhl. in Engl., Bot. Jahrb. 27: 73. 1899 [not E. huillense Rendle, 1899]. Eriocaulon lacteum Rendle, Cat. Afr. Pl. Welw. 2: 99. 1899. Eriocaulon huillense Engl. ex Moldenke, Résumé 289, in syn. 1959. Eriocaulon teuczsi Engl. & Ruhl., in herb.

Bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 68, 70, 73, & 77--78. 1899; Rendle, Cat. Afr. Pl. Welw. 2: 99. 1899; Fritsch, Bull. Herb. Boiss., sér. 2, 1: 1102--1104. 1901; Thiselt.-Dyer, Fl. Trop. Afr. 8: 245. 1901; Ruhl. in Engl., Pflanzenreich 13 (4-30): 40, 63, 80, 81, 286, & 287. 1903; Thiselt.-Dyer, Ind. Kew. Suppl. 2: 70. 1904; H. Lecomte, Bull. Soc. Bot. France 55: 647. 1909; Moldenke, Known Geogr. Distrib. Erioc. 21, 22, 35, 36, & 41. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 118 & 206. 1949; Moldenke, Phytologia 3: 328. 1950; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 128, 129, 139, 141, 144, 145, 151--155, 157, & 167, fig. 1--3, & pl. 7, fig. 10--12. 1955; Moldenke, Résumé 138, 144, 147--150, 289, & 483. 1959; Moldenke, Résumé Suppl. 1: 17. 1959; Astle, Kirkia 7: 95. 1968; Moldenke, Phytologia 18: 244, 245, 256, 320, 321, & 389 (1969), 19: 82 & 98 (1969), and 19: 423. 1970.

Illustrations: H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 128, fig. 1--3, & pl. 7, fig. 10--12. 1955.

Recent collectors describe this plant as an erect annual, 0.5 m. tall, with fleshy leaves, growing in permanently wet "dambo". Milne-Redhead & Taylor, however, refer to it as a tufted perennial, with white soft fleshy roots; leaves erect, from pale-green or green to bright-green but white below, very soft, semi-terete or semicircular in section, with rounded edges; sheaths pale-green, buff, or green and turning pinkish-buff, slightly swollen; scapes green or pale-green, obtusely ribbed; involucre bractlets pale-green to pale-brown or pale orange-buff; heads white; perianth white; anthers dark blackish-green or brown, growing in flooded grassland on gray sand or in boggy grasslands and in bogs, often under 1.5 dm. of water, in Brachystegia-Uapaca woodlands. The Dehn 342, cited below, includes a fine color painting of the plant on the same sheet.

The Fries, Norlindh, & Weimarck 2331 collection, also cited below, has leaves only 3 cm. in length and much broader than the Milne-Redhead & Taylor collections from Tanganyika (which exhibit leaves to 20 cm. long) and may represent a different taxon.

Rendle (1899), in describing his E. lacteum, comments that it is "Near E. Sonderianum Körn., but distinguished by its blunt leaves, the absence of keel or wing on the sepals, etc. Huilla.--

Widely caespitose, with tall sheaths and milk-white heads. Plentiful in damp meadows, growing among Droseraceae and species of Utricularia, and very plentiful in swampy places round Lopollo; Feb. to May 1860. Collected by Welwitsch in swampy meadows not farther than 300 paces from his house in April 1860. No. 2452. Growing somewhat sparsely in the very lofty spongy pastures of Morro de Lopollo along with Swertia stellarioides and small Leguminosae; end of April 1860. No. 2452b. On the higher spongy slopes of Serra de Oiahoia in the Humpata district; towards the end of April 1860. No. 2453." These collections cited by him are doubtless the cotypes of E. lacteum. Rendle's binomial is cited to "Rendle, in Hiern, Cat. Afr. Fl. Welw." by some authors like Hess (1955), who, by the way, says on p. 151 of his work that his illustrations of this species are on p. "138", but actually they are on page 128.

Eriocaulon huillense Engl. & Ruhl. is based on Antunes s.n. from Huila, Angola, deposited in the herbarium of the Botanisches Museum in Berlin; E. teusczii is based on Mechow 231 from Malanga, Loanda, Angola, also deposited in the Berlin herbarium. The E. huillense of Rendle, referred to in the synonymy above, is a synonym of E. mutatum N. E. Br. Thiselton-Dyer (1904) and Hess (1955) erroneously cite E. huillense Engl. & Ruhl. to page "78" of the Bot. Jahrb., instead of to p. 73.

Eriocaulon teusczii has been collected at altitudes of 960 20 2080 meters, flowering and fruiting from February to October and in December.

Hess (1955) discusses the species as follows: "Eriocaulon Teusczii besiedelt die gleichen Standorte wie E. pictum Fritsch; sie sind unter E. pictum beschrieben. Die beiden Arten kommen fast immer miteinander vor. Als häufiger Begleiter ist Syngonanthus Wahlbergii (Wikstr.) Ruhl. zu nennen. E. transvaalicum N. E. Br., E. mutatum N. E. Br. und Mesanthemum radicans würden nur ausnahmsweise in derselben Gesellschaft gefunden.....

"Am gesamten Material ist der Blütenbau einheitlich. Einzig die Farbe der Spitzen der Sepalen und der Brakteen variiert zwischen weisz, gelb-braun und schwärzlich, wobei die Extreme selten sind. Die Farbmerkmale sind nicht konstant, teilweise auch vom Alter der Pflanze abhängig, so dass sie in der Systematik nicht Verwendung finden können. Die verschiedenen Farben der Blütenköpfe sind vom Entwicklungsstadium abhängig. Die Höhe der Halme und die Länge der Blätter haben eine grosse Streuung, die auf den Standort zurückzuführen sein dürfte.....

"Eriocaulon Teusczii ist angegeben (as E. lacteum Rendle) aus Nord-Nigerien, Tanganyika, Nord- und Süd-Rhodesien und Moçambique. Im Süden von Angola ist sie nach eigenen Beobachtungen nebst E. pictum Fritsch die häufigste Eriocaulon-Art. Die Verbreitungsangaben von E. Teusczii sind nicht gut gesichert, da die Art oft mit E. pictum verwechselt wird.....

"Auf die trennenden Merkmale zwischen Eriocaulon Teusczii und der habituell kaum davon zu unterscheidenden E. pictum Fritsch ist unter letzterer Art hingewiesen.

"Rendle (1906) hat aus Süd-Rhodesien (Matopo Hills) eine neue Art, Eriocaulon matopense, beschrieben. Nach diesem Autor soll die Art mit E. lacteum Rendle verwandt sein, soll sich aber durch weniger scharfe Spitzen auf den Brakteen, kleineren Wuchs und durch schmalere Blätter von E. lacteum unterscheiden. Ich habe von E. matopense kein Material gesehen." The comparisons with E. pictum to which Hess refers are quoted by me in full in the present series of notes under that species. Hess cites for E. teusczii the following of his own collections in Angola: Hess 51/156, 51/293, 52/838, & 52/1514 from Benguela, 52/280, 52/745, 52/1805, 52/2047, & 52/2150 from Huila, and 52/510 & 52/2058 from Bié. Astle (1968) cites Astle 3300 from Zambia.

Additional citations: TANZANIA: Tanganyika: Milne-Redhead & Taylor 7785 (B), 8734 (B), 9163 (B). ANGOLA: Huila: Antunes s.n. [Huila] (B); H. Hess 52/280 (B); Welwitsch 2452 (Mu), 2453 (B, Mu, Mu, Z). Loanda: Mechow 231 (B--type, Mu--382--isotype, Z--isotype). ZAMBIA: E. A. Robinson 5716 (Mu). RHODESIA: N. C. Chase 1874 (Rh--27069); Dehn 342 (Mu); Fries, Norlindh, & Weimarck 2331 (S). SOUTHWEST AFRICA: Baum 324 (Mu--375).

ERIOCAULON TEXENSE Körn.

Bibliography: Körn., Linnaea 27: 594. 1856; C. Müll. in Walp., Ann. 5: 925 & 929 (1860) and 6: 1171. 1861; Körn. in Mart., Fl. Bras. 3 (1): 476. 1863; Morong, Bull. Torrey Bot. Club 18: 355--356. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 879. 1893; Coult., Contrib. U. S. Nat. Herb. 2: 459. 1894; Ruhl. in Engl., Pflanzenreich 13 (4-30): 32, 35, & 287. 1903; J. K. Small, Fl. Southeast. U. S., ed. 1, 236 (1903) and ed. 2, 236. 1913; Cory, Texas Agr. Exp. Sta. Bull. 550: 29. 1937; Moldenke, N. Am. Fl. 19 (1): 18 & 25. 1937; Moldenke, Phytologia 1: 327. 1939; Karling, Torreya 41: 106. 1941; Moldenke in Lundell, Fl. Texas 3 (1): 7. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 879. 1946; Moldenke, Known Geogr. Distrib. Erioc. 3 & 41. 1946; Moldenke, Alph. List Cit. 1: 166. 1946; Moldenke, Phytologia 2: 153. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 22 & 206. 1949; Moldenke, Alph. List Cit. 3: 784 & 850 (1949) and 4: 1107, 1170, & 1291. 1949; Moldenke, Phytologia 3: 400 (1950) and 3: 468--469. 1951; [Wiltshire], Rev. Appl. Myc. Ind. Fungi 1: 39, 50, & 393. 1954; Moldenke, Résumé 27 & 483. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 879. 1960; Moldenke, Résumé Suppl. 3: 7 (1962) and 12: [1]. 1965; Kral, Sida 2: 304, 305, & 307. 1966; Shinnars, Sida 2: 441. 1966; Moldenke, Résumé Suppl. 16: 2. 1968; Moldenke, Phytologia 17: 490 & 502 (1968), 18: 45 (1968), 18: 268 & 378--380 (1969), and 19: 330 & 333. 1970.

Illustrations: Kral, Sida 2: 304. 1966.

The initial letter of the specific epithet of this species is often uppercases by older writers, e.g., Müller (1860). Recent collectors have found the plant growing in bogs, in hardwood forests in sandy bottoms, and in seepage areas in scrub oak - pine-land associations, at altitudes of about 50 feet, flowering and fruiting in April and May. The only reported common name for it is "pipewort". In Louisiana Kral & Ricks found it "on muck of sphagnum Sarracenia-type bogs, forming mats of rosettes, the heads a startling white", "in peaty depressions in longleaf pine savanna bogs", "in hillside bogs in longleaf pine sandhills", and "in sphagnum mucky pockets in association with Sarracenia alata". Kral (1966) gives its general distribution as "Acid, sphagnum (Sarracenia-type) bogs, coastal plain, southwestern Alabama west to eastern Texas."

Kral also says "This rather rare Eriocaulon is part of the complex including E. lineare, E. septangulare.....I have not seen it in other than sphagnum Sarracenia-type bogs, and hence have no idea what habitat changes it expresses when submerged. It is locally abundant in central Louisiana, coating bog pot-holes with its small but showy white heads. Unlike the two other species of the complex, this Eriocaulon is a spring bloomer; by early summer no trace of it is to be seen, even the leaves appearing to vanish. The type locality for this species is Texas (Drummond 409, an isotype at NY) where it often is to be found in association with E. decangulare. In fact small specimens of Texas E. decangulare are often identified as E. texense. However, the heads of E. texense are soft in contrast to the harder heads of E. decangulare; the involucre bracts of E. texense are rounded to acute, sometimes squarrose, and quite dark in contrast to the more rigid, stramineous, narrowly acute to acuminate, bracts of E. decangulare; the scapes of E. texense are more slender and with less ridges than those of E. decangulare; E. texense has usually flowered, set fruit, and is dying back by the time the heads of E. decangulare are full."

Karling (1941) and Wiltshire (1954) refer to a fungus, Entophlyctis texana Karling, found on dead leaves of a pipewort in Texas. They identify the host as E. septangulare With., but it seems much more probable that, if it had characters which would lead to that identification, it was probably E. texense.

Material of E. texense has been misidentified and distributed in herbaria as E. compressum Lam., E. decangulare L., and Lachnocaulon anceps (Walt.) Morong. On the other hand, the F. A. Barkley 13543, distributed as E. texense, is the type collection of E. decangulare var. minor Moldenke; F. A. Barkley 13556, Herb. Zuccarini s.n. [Texas], Rowell 8071, and Tharp 44344b are also this variety; F. A. Barkley 13034, Correll & Correll 13516, E. Hall 675 ["635"], Painter & Barkley 13540, Rowell 8136, and Webster & Wilbur 3199 are E. decangulare f. parviceps Moldenke, of

which Tharp 44342 is actually the type collection; E. J. Palmer 13185 and O. Sanders 132 are E. compressum Lam., while Correll & Correll 12522 and Cory 57125 are Lachnocaulon anceps (Walt.) Morong.

According to Kral, F. A. Barkley 13543 & 13556, Painter & Barkley 13540, Rowell 8050 & 8136, and Tharp 4434c, 4434d, & 44344b are all immature specimens of E. decangulare L. In view of the fact that many of the specimens cited below were identified and annotated by me many years ago [some as far back as 1951] and that E. decangulare var. minor and E. decangulare f. parviceps were not recognized by me until 1968 and 1969, it seems very probable that some of these collections may actually represent one of the two latter taxa. Since they are now scattered in seven different herbaria, it will take some time to verify their identification, but this must eventually be done.

Additional citations: LOUISIANA: Beauregard Par.: Kral 20158 (N); Kral & Ricks 16992 (N). Vernon Par.: Kral 20078 (N); Kral & Ricks 16772 (N). TEXAS: Anderson Co.: Tharp s.n. [7-7-35] (Mi). Angelina Co.: Correll & Correll 27216 (Id). Jefferson Co.: G. L. Fisher s.n. [Nome, Apr. 27, 1938] (S). Milam Co.: Tharp 44343 (S). Tyler Co.: Correll, Johnston, & Edwin 22333 (Id); Tharp, Turner, & Johnston 54954 (Ws). Van Zandt Co.: H. Gentry 2481 (We). MOUNTED ILLUSTRATIONS: drawings & notes by Körnicker (B).

ERIOCAULON THAILANDICUM Moldenke

Bibliography: Moldenke, Phytologia 7: 88. 1959; Moldenke, Résumé Suppl. 1: 13 & 25. 1959; Moldenke, Biol. Abstr. 35: 1688. 1960; Hocking, Excerpt. Bot. A.4: 592. 1962; G. Taylor, Ind. Kew. Suppl. 13: 52. 1966.

Collectors describe this species as an herb, with white or whitish flowers, common in savannas or gregarious in wet localities and paddy fields, at altitudes of 50 to 200 meters, flowering and fruiting in October and December.

Citations: THAILAND: Sangkha Chand 571a [Herb. Royal Forest Dept. 18262] (Z--type); Smitinand 3605 [Herb. Roy. Forest Dept. 18261] (Sm).

ERIOCAULON THOUARSII H. Lecomte

Bibliography: H. Lecomte, Bull. Soc. Bot. France 55: 571-573. 1908; Prain, Ind. Kew. Suppl. 4, pr. 1, 82 (1913) and pr. 2, 82. 1958; Moldenke, Résumé Suppl. 17: 5. 1968; Moldenke, Phytologia 18: 432. 1969.

Since this taxon is not accounted for in any way in my treatment of the family for Humbert's Flora of Madagascar (1955), it may be worthwhile repeating the description of it as given by Lecomte (1908): "Folia caespitosa, erecto-patentia, lanceolata, acuta vel subacuta, glabra, pellucida, non fenestrata, 13--14-nervia, 14-5 [=14--15 ? or 4-5 ?] cm. longa, medio 2,5--3 mm.

lata. Pedunculi numerosi, glabri, 5—6-costati, torti, 7—11 cm. alti; vaginae laxae, oblique fissae, glabrae, 2—2,5 cm. longae; capitula cylindrico-globosa, alba, puberula, 4—5 cm. lata, bractae involucrantis disco breviores, obovatae, obtusissimae, glabrae, flavescens, bractae flores stipantes obovato-acuminatae, concavae, fiskeae, apice dorsi puberulae; receptaculum pilosum; flos ♂: sepala 3 in spatham antice fissam, 3-lobatam. apice ciliatam, connata; petalorum tubus lobis 3 minutis aequalibus, glanduligeris, apice pilosiusculis instructus; flos ♀: sepala 3 lanceolata, navicularia, 2-carinata, nigrescenti-fusca, apice ciliolata, ceterum glabra; petala 3, spathulata, obtusa, apice pilosa, glandulosa.....Elle se rapproche beaucoup de l'E. Hanningtonii N. E. Br. Mais cette dernière plante a les pétales dépourvus de glandes ou munis de glandes très peu développées, tandis que la plante recueillie par Du Petit-Thouars possède des glandes bien caractérisées."

A sheet of Petit-Thouars 2 in the herbarium of the Muséum National d'Histoire Naturelle in Paris is inscribed "Eriocaulon Thouarsii H. Lecomte" and may be the actual type of the species. I have identified and annotated it as E. quinquangulare L. There is no locality of collection indicated on the sheet.

ERIOCAULON THUNBERGII Wikstr.

Synonymy: Eriocaulon natans Afzel. ex Moldenke, Résumé Suppl. 1: 17, in syn. 1959.

Bibliography: Körn., Linnaea 27: 677. 1854; C. Müll. in Walp., Ann. 5: 926 & 944—945 (1860) and 6: 1171. 1861; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 879. 1893; Ruhl. in Engl., Bot. Jahrb. 27: 67, 71, & 81. 1899; Ruhl. in Engl., Pflanzenreich 13 (4-30): 61, 70, & 287. 1903; H. Lecomte, Bull. Soc. Bot. France 55: 645 & 646. 1909; Moldenke, Known Geogr. Distrib. Erioc. 21 & 41. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 879. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 111 & 206. 1949; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 136 & 137. 1955; Moldenke, Résumé 136 & 483. 1959; Moldenke, Résumé Suppl. 1: 17. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 879. 1960.

The initial letter of the specific epithet of this species is uppercased by Müller (1860) and other writers. Eriocaulon natans appears to be based on the same Afzelius collection preserved in the Berlin herbarium as serves also as the type of E. thunbergii.

Citations: SIERRA LEONE: Afzelius s.n. [Sierra Leone] (B-type, Z—isotype). MOUNTED CLIPPINGS: Ruhl. in Engl., Pflanzenreich (B).

ERIOCAULON THWAITESII Körn.

Synonymy: Eriocaulon twaitesii Körn. apud Ruhl. in Engl., Bot. Jahrb. 27: 68, sphalm. 1899. Eriocaulon thwaitesii Hook. f. ex Fyson, Fl. Nilg. & Puln. Hill-tops 3: 119, sphalm. 1921.

Bibliography: Körn., Linnaea 27: 627. 1856; C. Müll. in Walp.,

Ann. 5: 926 & 936 (1860) and 6: 1171. 1861; Hook. f., Fl. Brit. Ind. 6: 583—584. 1893; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 879. 1893; Ruhl. in Engl., Bot. Jahrb. 27: 68. 1899; Ruhl. in Engl., Pflanzenreich 13 (4-30): 13, 102, 105, 116, & 287. 1903; Fyson, Kew Bull. Misc. Inf. 1914: 331. 1914; Fyson, Fl. Nilg. & Puln. Hill-tops 1: 48, 427, & 432 (1915), 2: pl. 277 (1915), and 3: 119. 1921; Prain, Ind. Kew. Suppl. 5, pr. 1, 97. 1921; Fyson, Journ. Indian Bot. 2: 202 & 318 (1921) and 3: 18. 1922; Stapf, Ind. Lond. 3: 91. 1930; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 46. 1930; C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. 1, 9: 1617 & 1620. 1931; Moldenke, Known Geogr. Distrib. Erioc. 23, 24, 37, & 41. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 879. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 126, 127, 130, 205, & 206. 1949; Moldenke, Phytologia 3: 331 (1950), 3: 469 (1951), and 4: 339. 1953; C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. 2, 8 [3]: 1126, 1128, & 1333. 1956; Moldenke, Résumé 163, 167, 188, 190, & 483. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 879. 1960; Prain, Ind. Kew. Suppl. 5, pr. 2, 97. 1960; Thanikaimoni, Pollen & Spores 7: 186. 1965; Moldenke, Résumé Suppl. 15: 8 & 20. 1967; Kammathy, Rao, & Rao, Bull. Bot. Surv. India 9: 233. 1967; Moldenke, Phytologia 17: 383 (1968), 18: 264 & 325 (1969), 19: 11 & 242 (1969), and 19: 343. 1970.

Illustrations: Fyson, Fl. Nilg. & Puln. Hill-tops 2: pl. 277. 1915.

Jackson (1893) dates Körnicke's original publication of E. thwaitesii as "1854", but this is an error — pages 129—799 of this volume did not appear in print until 1856. The title-page of Fyson, Fl. Nilg. & Puln. Hill-tops, volume 3, is dated "1920", but the volume was not actually issued until 1921. The initial letter of the specific epithet of this taxon is naturally often uppercased, e.g., by Müller (1860). Kammathy and his associates (1967) cite Barnes s.n. from Mysore, India.

The species has been collected in flower and fruit in September. Because of the unavailability of Fyson's publications in so many libraries, it may be worth repeating his discussions here: "E. Thwaitesii Koern. (C. P. 790 and 769 in Herb. Kew. and 790 in Herb. Calc.);.....Leaves $1/2$ — 2 in. oblong acute, flat. Scapes many, 1—6 in. of various heights. Heads $1/4$ — $1/3$ in at first obconic, later truncate, dark gray. Involucral bracts very obtuse, pale. Receptacle hairy. Female sepals 3, equal and boat-shaped or 1 smaller or 2 only. Petals 3, very slender and bearing long hairs from near the base. Seeds oblong, brown. Ceylon; South India on the Pulneys; Anamalais and Nilgiris. The plants vary much in size. Those from higher levels on the Pulneys are much smaller than the type, even only $1/2$ in. high. They were described by me in Kew Bulletin 1914 as a new species, E. Mariae, and figured in my Flora of the Nilgiri and Pulney Hill-tops under that name, since the female sepals are 3 equally boat shaped instead of 2. But I find a plant C.P. 790 in Herb. Calc. the collection quoted by Koerniche Linnaea xxvii p. 627 as

in part his type, has the female sepals 3 but unequal, one being flat; and plants from 5,000 ft. on the Pulneys, in no other way distinguishable from what purports to be Koerniches type at Kew, with 3 sepals equal. It seems therefore that this is another instance of the sepals varying within the species (c.f. E. truncatum Ham.). At the same time since I do not find them spongy at the back, as described by Koerniche I may be wrong in so identifying these plants."

His description of E. mariae should also be noted here: "Scapes several, 1 to 2 inches, slender: sheath $1/2$ inch: mouth single, very acute, slightly enlarged. Leaves $1/2$ to $3/4$ inch by $1/12$ to $1/8$ inch, strongly ribbed, glabrous. Heads $1/8$ to $1/6$ inch: involucre bracts light brown, glabrous. Floral bracts acute, black with tufts of white hairs. Villi of receptacle very long and copious. Male flowers: — Sepals $1/25$ inch united in a spathe split in front. Corolla tube and lobes very small, glands large. Female flowers $1/16$ inch: petals divided almost to the base into a number of fine hairs. t. 277. Fyson 2086. Pulneys: at 7,500 feet, in a marsh on the downs above Kodaikanal. Not known elsewhere. The very dwarf habit, yet broad leaves, and the remarkably divided female petals make this distinct from any other."

The E. thwaitesii credited to Hooker (1900) is a synonym of E. neesianum Körn. Material of E. thwaitesii Körn. has been misidentified and distributed in herbaria as E. cinereum R. Br. and E. truncatum Hamilt. On the other hand, the Kuntze 5686, distributed as E. thwaitesii, is actually E. hookerianum Stapf; Bem-bower 31 is E. leucomelas Steud.; and E. Barnes B.9a, Blume s.n. Karta 317, Koorders 39495b, and Toroos 4441, 4572, & 5024 are all E. truncatum Hamilt. The Barnes, Koorders, and Toroos collections were incorrectly cited as E. thwaitesii by me in previous installments of these notes. Ritchie 1242 is a mixture with E. achiton Körn. and E. stellulatum Körn., while Thwaites C.P. 790 is a mixture with E. truncatum Hamilt.

Additional citations: INDIA: Madras: Fyson 4471 (S). State undetermined: Ritchie 1242, in part (T). CEYLON: Thwaites 790, in part (B—type, Z—isotype).

ERIOCAULON TOFIELDIIFOLIUM Schinz

Synonymy: Eriocaulon tofieldianum Schinz ex Moldenke, Bull. Jard. Bot. Brux. 27: 123, sphalm. 1957. Eriocaulon tofieldii-folium Schinz ex Friedrich-Holzhammer in Merxmüller, Prodr. Fl. Südw. Afr. 159: 2. 1967.

Bibliography: Schinz, Bull. Herb. Boiss., sér. 2, 1: 779. 1901; Ruhl. in Engl., Pflanzenreich 13 (4-30): 69 & 287. 1903; Prain, Ind. Kew. Suppl. 3: 70. 1908; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 158 & 265--269, fig. 1 & 5. 1955; Moldenke, Bull. Jard. Bot. Brux. 27: 123. 1957; Moldenke, Résumé 153 & 483.

1959; Friedrich-Holzhammer in Merxmüller, Prodr. Fl. Südw. Afr. 159: 1 & 2. 1967; Moldenke, Résumé Suppl. 16: 8 & 21. 1968; Moldenke, Phytologia 19: 323. 1970.

Illustrations: H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 265, fig. 1 & 5. 1955.

Volk describes this plant as "rare in marsh about well" in Southwest Africa, flowering and fruiting in December. Friedrich-Holzhammer (1967) cites the type collection, Dinter 378, and also Dinter 1757 and Volk 2744 from the same country.

Hess (1955) gives a detailed discussion of this taxon and its relationships, probably worth repeating here for the benefit of workers in libraries which do not have the original publication: "Bei der Durchsicht des Materials von Eriocaulon africanum Hochstetter fand ich dort eingeordnet zwei Bogen sehr gutes Material von Eriocaulon tofieldifolium H. Schinz. Schinz...hat nach Exemplaren von Dinter die Art als neu beschrieben und beigelegt, dass sich E. tofieldifolium durch weniger breit abgerundete, eher braune als schwarz Tragblätter von E. africanum unterscheidet. Die beiden Herbarbogen mit vollständig einheitlichem Material, auf die Schinz seine Diagnose stützte, tragen beide die gleiche Anschrift: 'Plantae africae austro-occidentalis, ex reg. Hereroland. Eriocaulon tofieldifolium Schinz, det. Hans Schinz, leg. K. Dinter, 1899, Nr. 378'. Auf den einen Bogen steht auf separatem Zettel der handschriftliche Vermerk Dinters: "378, sumpf. Stellen Waterberg, 31.III.1899'. Schinz.....hat im Anhang an die Diagnose diese Fundortangaben zitiert (unter dem Datum steht zwar 31.II.1899). Es besteht kein Zweifel, dass es sich bei den beiden Bogen um das Typus-Material von E. tofieldifolium H. Schinz handelt.

"Ruhland (1903) führt in seiner Monographie Eriocaulon tofieldifolium unter Zitierung der obgenannten Fundort als Synonym von E. africanum Hochst. an. Dies ist sicher nicht richtig; denn die beiden Arten stehen systematisch weit auseinander. Ruhland hat wahrscheinlich das Typus-Material von E. tofieldifolium nicht gesehen und nur auf die summarische Diagnose von Schinz abgestellt, in der die ausschlaggebenden Merkmale nicht angeführt sind. Schinz hat dann auf den beiden Bogen mit Eriocaulon tofieldifolium eigenhändig geschriebene Revisionsetiketten angebracht, die den Vermerk 'Eriocaulon africanum Hochst. det. H. Schinz, 24.10.1905' tragen.....

"Von Eriocaulon africanum wurde das von Ruhland (1903) zitierte Material untersucht, das von Tyson unter Nr. 2551 in Grigueland, nahe Clydesdale, gesammelt wurde. Auch diese Proben stammen aus dem Botanischen Museum der Universität Zürich; sie stimmen mit den Angaben in Ruhland...überein. Weiter wurden aus den botanischen Sammlungen der Eidgenössischen Technischen Hochschule die Einlagen, ausgegeben von Macovan und Bolus, Nr. 1203, verglichen. Nach der Anschrift stammen die Pflanzen ebenfalls aus

Griguland, nahe Clydesdale. In der Monographie von Ruhland..... ist aber unter derselben Nummer und den gleichen sammlern Hancock's Drift als Fundort angegeben.

"Zur Diagnose von Eriocaulon africanum in Ruhland....ist zu ergänzen, dass die Brakteen der Blüten meist an der Spitze spärlich behaart sind. Weiter sind die Sepalen der ♂ und ♀ Blüten gegen die Spitze hin gezähnt, wie dies für E. Woodii N. E. Br. angegeben ist (E. Woodii ist aber durch tief konkave Sepalen, die sich nicht in einer Ebene ausbreiten lassen, unschwer von E. africanum abzutrennen)."

He then summarizes the differences between the two species as follows: E. africanum — leaves to 4 mm. wide at the base; sheath to 4 cm. long, cylindric, the split mouth usually somewhat divergent; floriferous scape solitary, not twisted, 1—4 additional scapes recurved and with viviparous heads; heads flat, 6—8 mm. in diameter, blackish-brown; receptacle glabrous; receptacular bractlets blackish-brown, 2.3—2.6 mm. long, 0.8—1 mm. wide; pistillate sepals obovate, keeled, fleshy, acute or obtuse, always irregularly dentate toward the apex, pilose on the back and margins, gray-black, 1.4—1.6 mm. long, 0.9—1 mm. wide; staminate sepals 3, united for about 1/3 their length, otherwise just like the pistillate ones; pistillate petals 1.6—1.9 mm. long, 0.4—0.5 mm. wide; staminate petals just like the pistillate ones; anthers white or light-yellow.

Eriocaulon tofieldifolium — leaves to 8 mm. wide at the base; sheath to 3 cm. long, split, usually somewhat swollen below the mouth; scapes all floriferous, 8—20, twisted; heads spherical, 4—6 mm. in diameter, gray; receptacle pilose; receptacular bractlets yellow-brown, 2.4—2.6 mm. long, 1.2—1.4 mm. wide; pistillate sepals navicular, the ventral one somewhat smaller and only this one keeled, acute, narrowly winged on the keel, pilose on the back toward the apex, blackish-brown, 1.5—1.8 mm. long, the greatest width from the keel to the margin 0.3 mm., the wing to 0.05 mm. wide; staminate sepals united into a slit tube, the apex acute, pilose on the margins, yellow; staminate petals 3, free, elongate-cuneate, only 1.4—1.6 mm. long and 0.1—0.2 mm. wide, white, pilose only at the apex, with very small brown glands; staminate petals 3, very small, often glandless, ciliate; anthers blackish-brown.

He concludes "das Eriocaulon africanum Hochst. und E. tofieldifolium Schinz nicht miteinander verwandt oder gar identisch sind. Eriocaulon tofieldifolium steht aber E. transvaalicum N. E. Br. nahe. Für diese Untersuchung stand mir das Cotypus-Material von Eriocaulon transvaalicum N. E. Br. ebenfalls aus dem Botanischen Museum der Universität Zürich, zur Verfügung. Es umfasst zwei Bogen, die von N. E. Brown eigenhändig beschriftet sind. Die Pflanzen stammen aus der Sammlung Dr. A. Rehmann und tragen die Nr. 4787. Sie wurden von ihm in Transvaal bei Bosch Veld (näherer Fundort Buchenhouts Kloof Spruit) gesammelt.

"Habituell kann Eriocaulon tofieldifolium von E. transvaalicum

nicht unterschieden werden. Bei genauerer Untersuchung zeigt sich, dass bei E. tofieldifolium die Brakteen der Blüten auf den Rücken gegen die Spitze hin immer ziemlich dicht behaart sind, während jene von E. transvaalicum kahl sind oder nur wenige und kurze Haare tragen. Dadurch erscheinen die Blütenköpfe von E. tofieldifolium grau-braun und matt, während jene von E. transvaalicum dunkelbraun und glänzend sind. Ein faszierender Unterschied zwischen den beiden Arten in der Form der Sepalen ist nicht vorhanden. Die Petalen stimmen ebenfalls überein. In den ♀ Blüten von E. transvaalicum trägt meist nur die dorsale Petale eine braune Drüse; in den ♂ Blüten ist fast immer an jeder der ungleichen, zu winzigen Lappen reduzierten Petalen eine kleine hellbraune Drüse zu finden. Zur Diagnose von Eriocaulon transvaalicum in Ruhland (1903) ist nachzutragen, dass der Blütenboden lang wollig behaart ist. Soviel mir bekannt ist, wurde Eriocaulon tofieldifolium noch unter keinem andern Namen beschrieben. Das Typus-Material zu dieser Art ist im Botanischen Museum der Universität Zürich."

Citations: SOUTHWEST AFRICA: Volk 2744 (Mu, Z).

ERIOCAULON TOGOËNSE Moldenke

Synonymy: Eriocaulon xeranthemoides Heurck & Muell.-Arg. in Van Heurck, Obs. Bot. 103. 1870 [not E. xeranthemoides Bong., 1831]. Eriocaulon xeranthemoides Heurck ex Haines, Bot. Bihar & Orissa 6: 1070, in syn. 1924. Eriocaulon barteri Engl. ex Moldenke, Résumé Suppl. 1: 16, in syn. 1959.

Bibliography: Van Heurck, Obs. Bot. 103. 1870; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 880. 1893; Ruhl. in Engl., Bot. Jahrb. 27: 72 & 84. 1899; Ruhl. in Engl., Pflanzenreich 13 (4-30): 12, 65, 96, & 288, fig. 12. 1903; Engl. & Drude, Veget. Erde 9 (2): 264. 1908; Fyson, Journ. Indian Bot. 2: 200. 1921; Haines, Bot. Bihar & Orissa 6: 1070. 1924; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 44. 1930; Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Known Geogr. Distrib. Erioc. 20, 21, 41, & 42. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 880. 1946; Moldenke, Phytologia 2: 134. 1948; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 109, 112, 113, & 206. 1949; Moldenke, Phytologia 3: 469. 1951; E. J. Salisb., Ind. Kew. Suppl. 11: 88. 1953; Moldenke, Résumé 133, 137, 138, 294, & 483. 1959; Moldenke, Résumé Suppl. 1: 16 (1959) and 2: 6. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 880. 1960; Jaeger & Win-koun, Bull. Inst. Franç. Afr. Noir 24 [sér. A, no. 1]: 100. 1962; Moldenke, Résumé Suppl. 4: 6 (1962) and 17: 11. 1968; Moldenke, Phytologia 19: 410. 1970.

Illustrations: Ruhl. in Engl., Pflanzenreich 13 (4-30): 96, fig. 12. 1903; Engl. & Drude, Veget. Erde 9 (2): 264. 1908.

Barter 778, collected at Borgu in Northern Nigeria, is the type collection of all four names involved in the nomenclature of this taxon. The E. xeranthemoides Bong., referred to in the synonymy above, is a synonym of Syngonanthus xeranthemoides

(Bong.) Ruhl. On the sheet of Barter 778 in the Munich herbarium Schultes has written "Proximum videtur Eriocaulini xeranthemo Mart." Hooker (1893) and Haines (1924) actually place the name, E. xeranthemoides Heurck, in synonymy under E. xeranthemum Mart. of India, an entirely untenable disposition of it!

Collectors have found E. togoense growing at 300 meters altitude, flowering and fruiting in September and November. The Raynals say that Raynal & Raynal 5148 ter is identical with their 5131 ter & 5204. They found the plant growing in the alluvium of the Niger River on inundated prairies. Material has been misidentified and distributed in herbaria as E. pulchellum Körn. On the other hand, the Winkoun 23, distributed as E. togoense, is actually E. antunesii Engl. & Ruhl.

Citations: MALI: Soudan: Jaeger 5224 (Gg); Raynal & Raynal 5148 ter (Z), 5204 (Z-illustr., Z-illustr.). REPUBLIC OF GUINEA: Boismare 408 [Herb. Chillou 3926] (An). TOGO: Schroeder 162 (Ac, B). NIGERIA: Northern: Barter 778 (B--type, Mu--297--isotype, S--isotype, Ut--327--isotype).

ERIOCAULON TONKINENSE Ruhl.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 61, 72, & 287. 1903; Prain, Ind. Kew. Suppl. 3: 70. 1908; Moldenke, Known Geogr. Distrib. Erioc. 26 & 41. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 136 & 206. 1949; Moldenke, Résumé 176 & 482. 1959; Moldenke, Phytologia 19: 40. 1969.

Thus far this species is known only from the type collection, cited below.

Citations: INDOCHINA: Tonkin: Balansa 247 (B--type, Br--isotype, N--isotype, N--photo of isotype, Z--photo of isotype).

ERIOCAULON TORTUOSUM F. Muell.

Bibliography: F. Muell., Fragm. 1: 91--92. 1859; Benth., Fl. Austral. 7: 191, 196, & 792. 1878; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 879. 1893; Ruhl. in Engl., Pflanzenreich 13 (4-30): 66, 98, & 287. 1903; Moldenke, Known Geogr. Distrib. Erioc. 41 & 61. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 879. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 153 & 206. 1949; Moldenke, Résumé 209 & 483. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 879. 1960.

Citations: AUSTRALIAN REGION: AUSTRALIA: Northern Territory: N. Holtze s.n. [near Darwin, 3.1904] (S, Z).

ERIOCAULON TOUMOUENSE Moldenke, Résumé Suppl. 17: 4 & 10, hyponym (1968), nom. nov.

Synonymy: Eriocaulon guineense Moldenke, Résumé Suppl. 4: 6, nom. nud. (1962), Phytologia 8: 386. 1962 [not E. guineense Steud., 1855].

Bibliography: Moldenke, Résumé Suppl. 4: 6. 1962; Moldenke, Phytologia 8: 386--387. 1962; Hocking, Excerpt. Bot. A.6: 455. 1963; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1962: 29.

1963; Moldenke, Biol. Abstr. 42: 1517. 1963; Moldenke, Résumé Suppl. 17: 4 & 10. 1968.

The E. guineense Steud., referred to in the synonymy above, is a synonym of Mesanthemum radicans Körn.

Citations: REPUBLIC OF GUINEA: Boismare 386 [Herb. Chillou 3904] (An--type, Z--isotype).

ERIOCAULON TRANSVAALICUM N. E. Br.

Bibliography: N. E. Br. in Thiselt.-Dyer, Fl. Cap. 7: 54. 1897; Rendle, Cat. Afr. Pl. Welw. 2: 100. 1899; Ruhl. in Engl., Bot. Jahrb. 27: 71 & 81. 1899; Ruhl. in Engl., Pflanzenreich 13 (4-30): 63, 81, & 287. 1903; Thiselt.-Dyer, Ind. Kew. Suppl. 2: 70. 1904; Moldenke, Known Geogr. Distrib. Erioc. 22 & 41. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 122 & 206. 1949; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 148, 155--158, 267, & 269, fig. 3, & pl. 8, fig. 10. 1955; Moldenke, Résumé 147, 153, & 483. 1959; Moldenke, Résumé Suppl. 3: 16 (1962), 16: 8 (1968), and 17: 4, 9, & 10. 1968; Meikle, Kew Bull. 22: 143. 1968; Moldenke, Phytologia 16: 8 (1968), 17: 454 (1968), 18: 49 (1968), and 19: 15. 1969; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1968: 24 & 25. 1969.

Illustrations: H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 248, fig. 3, & pl. 8, fig. 10. 1955.

This species has been found growing at altitudes of 960 to 1650 meters, flowering and fruiting from March to May and in December. Milne-Redhead & Taylor describe it as having green or rather yellow-green leaves, many-veined, paler below, with large cells showing, turning brown when dead, the sheaths green or rather pale-green, the scapes pale-green and terete, the heads greenish-black, the bractlets greenish-black, the filaments white, and the anthers greenish-black, growing at the edge of small pools in marshy valleys and on boggy slopes of bare areas with iron-rich water seeping over muddy soil. Rendle (1899) states that it is closely related to E. andongense Welw., while Meikle (1968) avers it to be related, rather, to E. deightonii Meikle. For a detailed comparison of E. transvaalicum with E. tofielidifolium Schinz, see under the latter species in these notes.

Hess (1955) discusses the species thoroughly, saying, in part: "Diese Art wurde an 6 teilweise weit auseinander liegenden Stellen im Süden von Angola gesammelt. Als Vergleichs-Material standen mir die Cotypen aus dem Botanischen Museum der Universität Zürich zur Verfügung. Es handelt sich dabei um zwei Bogen, die von N. E. Brown eigenhändig angeschrieben wurden. Sie stammen aus der Sammlung von Dr. A. Reimann und tragen die Nummer 4787. Fundort: Bosh Veld in Transvaal.

"Die Original-Diagnose von Brown (1897) ist recht vollständig und genau, dagegen ist jene von Ruhland (1903) zu summarisch.....

"Eriocaulon transvaalicum wurde nur an offenen, kahlen Quell-tümpeln, auf schlammigen, sandig-lehmigen Boden gefunden. Junge

Pflanzen sind meist von Rieselwasser überflutet. Die Art bildet lockere Bestände. Als gelegentlich mit Eriocaulon transvaalicum vorkommende Eriocaulaceen wurden E. Teusczii Engl. et Ruhl., E. pictum Fritsch und Syngonanthus Wahlbergii (Wikstr.) Ruhl. notiert.....

"Habituell stimmen die Pflanzen aller Nummer mit dem Original-Material überein. Minimale und kleineswegs konstante Abweichungen zeigen die ♀ Blüten der Nr. 51/293a: die Sepalen tragen oft 1—3 kurze, weisse Haare. Die ventrale Sepale ist oft etwas kürzer und weniger scharf gekielt als die beiden lateralen Sepalen. Meist ist sie auch nicht geflügelt. Die Farbe der Blüten ist mehr grau als die am Original-Material." He continues with minute details of other differences shown by his various collections, and then concludes "Die Beschreibungen zeigen, dass zwischen dem Material der verschiedenen Fundorte kleine Abweichungen bestehen, die aber nie konstant und nur unbedeutend sind. Keine Probe zeigt eine vollständige Übereinstimmung mit dem Original-Material von Brown. Am gesamten Belegmaterial aus Angola fehlt meist die Drüse an der dorsalen Sepale, während sie am Original-Material meist vorhanden ist. Zudem ist die Farbe der Brakteen und der Sepalen an den Pflanzen aus Angola grau bis schwärzlich. Bei Eriocaulon transvaalicum findet man aber graubraune bis schwarz-braune Farbtöne. Dazu ist zu bemerken, dass das Material von Brown zur Zeit, als er es bearbeitete, bereits 20 Jahre alt war. Es ist durchaus möglich, dass der Farbton nach Jahren im Herbar umschlägt; ich möchte deshalb aus diesen Unterschied nicht zuviel Gewicht legen. Diese Formen sind deshalb zu Eriocaulon transvaalicum zu stellen.....

"Eriocaulon transvaalicum wurde bisher nur aus Transvaal angegeben; diese Art dürfte in Angola weiter verbreitet sein, als dies aus den 4 Fundstellen hervorgeht,...Eriocaulon transvaalicum steht morphologisch E. tofieldifolium Schinz nahe. E. tofieldifolium hat gegen die Spitze hin dicht behaarte Brakteen und Sepale (vgl. dazu Hess [1954]). Dadurch unterscheidet sich diese Art, die im Hereroland (südlich an Angola angrenzend) vorkommt, von E. transvaalicum. Es wäre nun durchaus möglich, dass in Süd-Westafrika E. transvaalicum und E. tofieldifolium nebeneinander vorkommen, Bastarde bilden, und dass diese Bastardschwärme nach Norden, nach Angola, eingewandert sind. Jene Proben aus Angola, die an den Sepalen 1—3 kleine Haare aufweisen, lieszen sich so als hybridogene Zwischenformen deuten. Dies ist aber bloß eine Hypothese; ihre Richtigkeit könnte nur experimentell bewiesen werden."

He cites from Benguela H. Hess 51/293a, 51/318, 51/386, 52/1436, & 52/1512 and from Huambo H. Hess 52/884. The Stolz 1344, distributed as E. transvaalicum, is actually E. buchananii Ruhl.

Citations: BURUNDI: Lewalle 1419 (Rf). TANZANIA: Tanganyika: Milne-Redhead & Taylor 9945 (B), 10481 (B). ANGOLA: Benguela: H. Hess 52/1436 (B, Z).

ERIOCAULON TRANSVAALICUM var. HANNINGTONII (N. E. Br.) Meikle

Synonymy: Eriocaulon hanningtonii N. E. Br. in Thiselt.-Dyer, Fl. Trop. Afr. 8: 253. 1901. Eriocaulon branningtonii N. E. Br. ex Moldenke, Résumé Suppl. 10: 5, in syn. 1964.

Bibliography: N. E. Br. in Thiselt.-Dyer, Fl. Trop. Afr. 8: 253. 1901; Ruhl. in Engl., Pflanzenreich 13 (4-30): 62, 74, & 285. 1903; Prain, Ind. Kew. Suppl. 3: 69. 1908; H. Lecomte, Bull. Soc. Bot. France 55: 573. 1908; C. H. Wright, Kew Bull. Misc. Inf. 1919: 264. 1919; Moldenke, Known Geogr. Distrib. Erioc. 21 & 35. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 117 & 204. 1949; Moldenke, Résumé 144, 150, & 481. 1959; Moldenke, Résumé Suppl. 10: 5 (1964) and 17: 4, 9, & 10. 1968; Meikle, Kew Bull. 22: 142. 1968; Moldenke, Phytologia 18: 49. 1968; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1968; 24 & 25. 1969.

Recent collectors have found this plant growing at 750 feet altitude, flowering and fruiting in May and July. Fisher & Schweickerdt report it as frequent in wet sand of roadsides. The type was collected by James Hannington — in whose honor it was named — at Kwa Chiropa, Tanganyika, in 1883, and is deposited in the herbarium of the Royal Botanic Gardens at Kew. Mooney, on the label of Mooney 9012, suggests that E. dembianense A. Chiov. is conspecific with E. hanningtonii. Schlieben 2332a is a mixture with Diplacrum africanum C. B. Clarke.

Citations: TANZANIA: Tanganyika: Schlieben 872 (B), 2332a, in part (S). MOZAMBIQUE: Niassa: Leach & Rutherford-Smith 10953 (Mu). Quelimane: Faulkner K.22 (K, N, S, S, Z). Province undetermined: Fisher & Schweickerdt 252 (Rh—22812).

ERIOCAULON TRILOBATUM Ruhl.

Bibliography: Ruhl. in Engl., Bot. Jahrb. 27: 71 & 81—82. 1899; Ruhl. in Engl., Pflanzenreich 13 (4-30): 63, 82, & 287. 1903; Thiselt.-Dyer, Ind. Kew. Suppl. 2: 70. 1904; H. Lecomte, Bull. Soc. Bot. France 55: 571. 1908; Moldenke, Known Geogr. Distrib. Erioc. 22 & 41. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 123 & 206. 1949; Moldenke, Phytologia 3: 469. 1951; Moldenke in Humbert, Fl. Madag. 36: [23] & 28—29, fig. 3 (10—16). 1955; Moldenke, Résumé 156 & 483. 1959.

Illustrations: Moldenke in Humbert, Fl. Madag. 36: [23], fig. 3 (10—16). 1955.

Leaves cespitose, linear-lanceolate or parallel-linear, elongate, 14—28 cm. long, 7—8 mm. wide at the midpoint, rather obtuse at the apex, wider at the base, many-veined, fenestrate, otherwise not pellucid, erect or spreading, glabrous; peduncles aggregate, many or rather many, dark olive-green in the sulcations in drying, 25—50 cm. long, 5- or 6-costate, twisted; sheaths rather loose, 7—16 cm. long, about half as long as the leaves, very densely and persistently spreading-villose, obliquely split, entire and acute at the mouth; heads finally semi-globose, rather hard, 7—9 mm. wide, white-villous at the summit; involucre bractlets broadly obovate, brunnescens, slightly keeled, rather acutish at the apex, subglabrous or sparsely pilose; receptacular

bractlets narrower, rather rigid, acute at the apex, pilose at the summit; staminate florets: sepals connate at the base into an anteriorly split spathe, obovate, olivaceous or fuscous-green, rounded-obtuse at the apex, ciliate; petal-tube with 3 small subequal lobes at the apex, the lobes ciliate, slightly glanduliferous; anthers black; pistillate florets: sepals 3, broadly ovate, green, somewhat concave, very abruptly acute at the apex, pilose on the back at the apex; petals 3, oblong-spatulate, much broader than the sepals, greenish-white, pilose at the apex and margins, glanduliferous.

This species is endemic to Madagascar, where it is known as "fotsivolo". Collectors have found it in marshes, swamps, and bogs in rainforests. Humbert's Flora of Madagascar (1955) says "Marais, tourbières, rocaillies humides, jusqu'à 1.600 m. alt.; fl.: septembre--novembre."

The species is based on Hildebrandt 3715 and s.n., both from Androgoloaka, in central Madagascar, collected in November, 1880, and probably both parts of the same collection. Ruhland (1899) says "Die ansehnliche Form steht dem ebenfalls aus Madagascar stammenden E. piliflorum Ruhland am nächsten."

Additional citations: MADAGASCAR: Afzelius s.n. [Moramanga, 12.10.1912] (S); Armand 76 (P); Baron 488 (P); D'Alleizette 623m (P), s.n. (P); Decary 6120 (P), 18384 (P); R. Heim s.n. [24 sept. '34] (P), s.n. [fin sept. 1934] (P); Herb. Jard. Bot. Tananarive 1040 (S); Hildebrandt 3715 (B—cotype, Mu—385—cotype, P—cotype, P—cotype, P—cotype), s.n. [Nov. 1880] (Mu—378—cotype); Humbert 11140 (P); Humbert & Cours 23857 (Z); Perrier de la Bâthie 2244 (P), 7242 (P), 7244 (P, P), 14282 (P), 18255 (P); Scott-Elliott 2271, in part (P); Viguier & Humbert 907 (N, P). CULTIVATED: Madagascar: Herb. Jard. Bot. Tananarive 1204 (S), 1205 (S).

ERIOCAULON TRILOBATUM var. GLABRESCENS Moldenke

Bibliography: Moldenke, Phytologia 3: 417. 1951; Moldenke in Humbert, Fl. Madag. 36: [23] & 29—30, fig. 3 (17). 1955; Moldenke, Résumé 156 & 483. 1959.

Illustrations: Moldenke in Humbert, Fl. Madag. 36: [23], fig. 3 (17). 1955.

This variety differs from the typical form of the species in having its leaves and sheaths completely glabrous throughout at all times.

In Humbert's Flora of Madagascar (1955) the habitat of this endemic variety is described as "Dépressions humides sur latérite de gneiss et basalte; rocaillies humides et ombragées; fl.: aout--novembre". Perrier de la Bâthie 7243 exhibits proliferating viviparous heads.

Citations: MADAGASCAR: Cours 788 (P); Decary 75 (P); Humbert 18055 (N—photo of type, P—type, Z—photo of type); Perrier de la Bâthie 7243 (P), 7251 (N, P).

ERIOCAULON TRISECTUM Satake

Bibliography: Satake, Journ. Jap. Bot. 15: 144, fig. 2. 1939; Satake in Nakai & Honda, Nov. Fl. Jap. 6: 12, 33, 78, & 87, fig. 13. 1940; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] 23-24. 1940; Hill & Salisb., Ind. Kew. Suppl. 10: 86. 1947; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 133 & 206. 1949; Moldenke, Résumé 172 & 483. 1959.

Illustrations: Satake, Journ. Jap. Bot. 15: 144, fig. 2. 1939; Satake in Nakai & Honda, Nov. Fl. Jap. 6: 33, fig. 13. 1940.

The only common name recorded for this endemic Formosan species is "rengeti-hosikusa". Satake (1940) cites from Formosa only the type collection, gathered by Yoshihiko Yamamoto and K. Mori in November, 1932, at Rengeti, in the province of Taityu, and deposited in the herbarium of the University of Taihoku, and the following additional collections: Hasioka s.n., Hibino & Suzuki s.n., and Kudo s.n., all from the same locality.

ERIOCAULON TRUNCATUM Hamilt.

Synonymy: Eriocaulon truncatum Buch.-Ham. ex Mart., in Wall., Pl. Asiat. Rar. 3: 29. 1832 [not E. truncatum Harms, 1959]. Eriocaulon truncatum Mart. ex Steud., Syn. Pl. Glum. 2: [Cyp.] 334. 1855. Eriocaulon glabriflorum Ridl., Journ. Fed. Malay States Mus. 10: 154-155. 1920. Eriocaulon truncatum var. vera Fyson, Journ. Indian Bot. 2: 199. 1921. Eriocaulon truncatum "Ham. ex Mart." apud Milne-Redhead in Hook., Icon. Pl. 34: pl. 3389. 1939. Eriocaulon truncatum Wall. ex Moldenke, Known Geogr. Distrib. Erioc. 41, in syn. 1946. Eriocaulon capitulum Miq. ex Moldenke, Résumé Suppl. 1: 16, in syn. 1959. Eriocaulon truncatum f. longiculmis Teijsm. ex Moldenke, Résumé Suppl. 1: 18, in syn. 1959. Eriocaulon truncatum var. α Körn. ex Moldenke, Résumé Suppl. 1: 18, in syn. 1959. Eriocaulon truncatum "Buch.-Ham. ex Mart." apud Backer & Bakh., Fl. Java 3: 25. 1968. Eriocaulon truncatum Hamilt. apud K. Larsen, Dansk Bot. Ark. 23: 397, sphalm. 1966. Eriocaulon luzulaefolium var. minus Mart., in herb. Eriocaulon truncatum Wight, in herb.

Bibliography: Mart. in Wall., Pl. Asiat. Rar. 3: 29. 1832; Wall., Numer. List 207. 1832; Steud., Nom. Bot., ed. 2, 1: 586. 1840; Kunth, Enum. Pl. 3: 555 & 614. 1841; D. Dietr., Syn. Pl. 5: 264. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 270 & 334. 1855; Körn., Linnaea 27: 631-633. 1856; C. Müll. in Walp., Ann. 5: 926 & 937 (1860) and 6: 1171. 1861; Benth., Fl. Hongk. 382. 1861; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 1, 341. 1864; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 24-26. 1888; Hook. f., Fl. Brit. Ind. 6: 578 & 585. 1893; Maxim., Diagn. Pl. Nov. Asiat. 8: 6 & 14. 1893; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 879. 1893; Ruhl. in Engl., Bot. Jahrb. 27: 68. 1899; Hook. f. in Trimen, Handb. Fl. Ceylon 5: 2, 7-8, & 412. 1900; Ruhl. in Engl., Pflanzenreich 13 (4-30): 13, 103, 107, & 287. 1903; Prain, Beng. Pl., ed. 1, 1127. 1903; C. H. Wright,

Journ. Linn. Soc. Lond. Bot. 36: 201. 1903; H. Lecomte, Journ. de Bot. 21: 89, 93—94, & 131. 1908; Hosseus, Beih. Bot. Centralbl. 28 (2): 372. 1911; H. Lecomte, Fl. Gén. Indo-Chin. 7: 3 & 16. 1912; H. Lecomte, Not. Syst. 2: 214 & 393. 1913; H. Hallier, Beih. Bot. Centralbl. 34 (2): 46. 1916; Palm, Svensk. Bot. Tidsk. 14: 264. 1920; H. N. Ridl., Journ. Fed. Malay States Mus. 10: 154—155. 1920; E. D. Merr., Bibl. Enum. Born. Pl. 110—111. 1921; Hayata, Icon. Pl. Formos. 10: 55 & 272. 1921; Fyson, Journ. Indian Bot. 2: 199, 200, & 202 (1921) and 3: 17 & 18. 1922; E. D. Merr., Enum. Philip. Flow. Pl. 1: 193. 1922; Haines, Bot. Bihar & Orissa 6: 1067 & 1070 (1924) and 1: 80. 1925; H. N. Ridl., Fl. Malay Penins. 5: 135. 1925; A. W. Hill, Ind. Kew. Suppl. 6: 78 (1926) and 7: 89. 1929; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 46 & 49. 1930; C. E. C. Fischer in Gamble, Fl. Presid. Madras 9: 1613 & 1619. 1931; Milne-Redhead in Hook., Icon. Pl. 34: pl. 3389. 1939; Nakai & Honda, Nov. Fl. Jap. 6: 20 & 87. 1940; Erlandsson, Arkiv Bot. 30 B (2): 2—4, fig. 1 b & 1 d. 1942; Masamune, Trans. Nat. Hist. Soc. Taiwan 33: 13. 1943; Moldenke, Known Geogr. Distrib. Erioc. 24—27, 35, 44, & 61. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 879. 1946; Moldenke, Alph. List Cit. 1: 268 (1946), 2: 455, 461, 576, & 625 (1948), 3: 659, 727, 879, & 971 (1949), and 4: 1011, 1201, 1205, 1260, & 1288. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 125, 127, 129, 132, 134—136, 138, 139, 141, 143—146, & 206. 1949; Moldenke, Phytologia 3: 469. 1951; M. R. Henderson, Malay. Wild Fls. 212. 1954; Santapau & Raizada, Indian For. Rec. 4 (6): 167. 1955; Koyama, Philip. Journ. Sci. 84: 374. 1956; C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. 2, 8 [3]: 1123—1124, 1127, & 1333. 1956; Moldenke, Résumé 159, 163, 165, 167, 170, 173, 174, 176, 178, 180, 184, 188, 190—193, 293, 480, & 483. 1959; Moldenke, Résumé Suppl. 1: 12, 16, & 18. 1959; Van Royen, Nov. Guin., new ser., 10: 23, 26, 36, 38, & 44, fig. 4 R. 1959; Van Royen, Blumea 10: 130. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 879. 1960; Moldenke, Résumé Suppl. 3: 17, 18, 20, & 28 (1962) and 6: 8. 1963; Prain, Bengal Pl., ed. 2, 2: 848. 1963; Legris, Trav. Sect. Scient. Inst. Franç. Pond. 6: 549 & 565. 1963; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 2, 341. 1964; Brunig, Govt. Sarawak Sympos. Ecol. Res. Humid Trop. Veg. 311. 1965; Van Royen, Nov. Guin. Bot. 14: 467. 1965; Thanikaimoni, Pollen & Spores 7: 186. 1965; K. Larsen, Dansk Bot. Ark. 23: 378, 380, 381, & 397, fig. 16. 1966; Datta & Majumdar, Bull. Bot. Soc. Bengal 20: 39. 1966; Tingle, Check List Hong Kong Pl. 54. 1967; Santapau, Bull. Bot. Surv. India 8: 48. 1967; Ornduff, Reg. Veg. 55: 13 & 118. 1968; Backer & Bakh., Fl. Java 3: 25—26. 1968; Vajravelu, Joseph, & Chandrasekaran, Bull. Bot. Surv. India 10: 81. 1968; Arora, Bull. Bot. Surv. India 10: 65. 1968; Moldenke, Résumé Suppl. 16: 9 (1968) and 17: 11. 1968; Moldenke, Phytologia 17: 461 (1968), 18: 52, 57, 98, 177, 189, 274, 303, 309, 435, & 441 (1969), 19: 13, 26, 36, 76, & 86 (1969), and 19: 239, 243—246, 250, 329, 337, 341, 343, 348, 414, & 424. 1970.

Illustrations: Fyson, Journ. Indian Bot. 2: 199. 1921; Erlands-

son, Arkiv Bot. 30 B (2): 2, fig. 1 b & 1 d. 1942; Van Royen, Nov. Guin., new ser., 10: 36, fig. 4 R. 1959; K. Larsen, Dansk Bot. Ark. 23: 380, fig. 16. 1966.

Eriocaulon truncatum is based on Hamilton s.n. from the Monghir Mountains in Bihar, India, which is Wallich 2368. Eriocaulon luzulaefolium var. minus appears to be based on H. Bruce 18 from Assam, deposited in the herbarium of the Jardin Botanique de l'Etat at Brussels, E. truncatum Mart. is based on Wallich 6071, in part, in the herbarium of the Botanisches Museum at Berlin, E. truncatum Wight on Wight 2368 in the same herbarium (probably a case of mislabeling of Wallich 2368), and E. truncatum f. longiculmis on Teijsmann s.n. from Java, deposited at Utrecht. The E. truncatum credited to Harms, referred to in the synonymy above, is a synonym of E. sexangulare L.

Eriocaulon glabriflorum was based on Ridley 8144 & 15671 from Tuaga Tujoh, Burau, in the Langkawi Islands, C. B. Robinson 6239 also from Burau, C. B. Robinson s.n. from Teluk Wau on Tereu Island, and Annandale s.n. from Singgora. Ridley says of this plant "This little plant belongs to the same set as E. truncatum, Ham., but is always much more slender with narrower leaves and smaller heads. It differs also in its perfectly glabrous perianth of which the segments also are much narrower." Van Royen (1959), however, regards the two taxa as conspecific. He describes E. truncatum in detail, giving its overall distribution as "India, China, Indo China, Malay Peninsula, Sumatra, Borneo, Luzon, Java, Karimun Djawa Islands, Misool, Tanimbar Islands, New Guinea", and the habitat as "Growing in mud of a marshy gully in grass plains at low altitudes". He misdates Körnische's (1856) work as "1954", and cites Van Royen 3399, 3600, & 4467 from New Guinea in the Leiden herbarium. Other collectors have found the species in rice fields and paddies, wet and open wet places, and springy places at altitudes to 240 meters above sea level, flowering and fruiting in January, May, June, and August to November. Vernacular names reported for it are "babawabgan", "doehoet si hopo", and "pipewort". Steward, Chiao, & Cheo report that the "scales" are chalky-white. Thwaites reports it growing in small dense bunches in wet crevices of rocks on hillsides in Ceylon. Santapau & Raizada (1955) say of it: "In moist soil, somewhat more abundant than the other two species, but rare in the area" in Saurashtra, India, citing Santapau 16362 & 16363.

Backer & Bakhuizen van den Brink (1968) give as their partial description of this species "Interfloral bracts obtuse, oblong-obovate; receptacle glabrous; basal bract of peduncle loosely appressed, with an oblique, acute, often 2--3-dentate mouth. Heads oblate-hemispheric, 4.5--5.5 mm across; involucre bracts oval-oblong-obovate, obtuse to broadly rounded, subdentate: ♂: sepals free or connate into a unilaterally split sheath, with a dark-coloured top; petals minute, apically pubescent; ♀: sepals 2, linear-spatulate to lanceolate-spatulate; petals 3, near the top

with a gland. Leaves linear-lanceolate, rather obtuse, 2--6 cm by 1--8 mm. 0.05--0.20; I--XII; W. C., Mad.; 15--1300; swampy rice- and grass-fields, brook borders, ditches, boulders in rivers; locally often numerous" in Java.

Kunth (1841) says of E. truncatum: "E. luzulaefolio simillimum, bracteis sat distinctum" and throws out the query "An certe acaulis?" He bases his description entirely on Wight 2368 (by which is doubtless meant Wallich 2368, the type collection). The same distinguished author says under E. xeranthemum Mart. "E. nepalensi et truncato proximum, licet involucrum radians", Milne-Redhead (1939) avers that it is closely related to E. annum Milne-Redhead from Africa.

Thwaites & Hooker (1864) regarded both E. thwaitesii Körn. and E. atratum Körn. as in part synonymous with E. truncatum and in part synonymous with E. sexangulare L. Hooker (1893) gives E. cinereum Hamilt. and Leucocephala spathacea Roxb. as synonyms of E. truncatum, but I regard the former as E. hamiltonianum Mart. and the latter as E. cinereum R. Br. Prain (1903) follows Hooker in regarding Leucocephala spathacea as a synonym of E. truncatum, reporting that the latter grows "In all the provinces [of Bengal]. A herb of rice-fields and marshy ground." Sebastine & Ramamurthy (1966) record it as "common" in Kerala, India, and cite their no. 15315. Vajravelu & his associates (1968) also state that it is common in Kerala, citing Vajravelu 19120.

Fyson (1921) restricts the typical form of this species to "Tipperah, Mts. of Monghir", Bihar, India, because the type collection is from that locality and is described by Martius (1832) as having three sepals to each floret, while Körnicke, Hooker, Ruhland, and, in fact, all later writers describe the flowers as having only two sepals. He feels that all material from elsewhere and ascribed to E. truncatum belongs actually to var. disepalum Fyson. His description of the species, however, is a composite one so as to include both the typical and the separated forms: "leaves usually 1-3 in. flat, narrowed from the base. Scapes several. Heads hemispheric. Involucre horizontal, scarious, not or hardly projecting beyond the head. Receptacle glabrous. Floral bracts very obtuse, nearly glabrous. Female sepals narrow, 2 boat-shaped, toothed at the apex, and third sepal if present acute; or 2 only. Petals 3 narrow. Bengal, Assam, North Burma and southwards to Malacca; S. India and Ceylon. Var. a vera, Tipperah, Mts. of Monghir. This I take to be the true species, for Mart.....describes the flower as having a third sepal. But Koerniche in Linnaea xxvii, p. 633, Hooker in F. B. I. l.c. and Ruhl. l.c. both give the commoner 2-sepalled flower of the next variety....Var. b di-sepala. Female sepals 2, otherwise as in the type. The wider distribution given for the species. For a similar variation in the female sepals see E. Thwaitesii Koern. Two sheets in Herb. Calc. unfortunately without precise locality but one marked C. India, are similar in many respects, but the floral bracts are cuneate acute, not round-

ed. The female sepals vary in the same head, 3 equally boat-shaped or one linear, or two only. Except for the glabrous receptacles these plants might be of E. Dianae."

The Erlandsson (1942) reference in the bibliography of this species is sometimes cited as "1940", but the part of the work involved here was not actually issued until February 25, 1942. Larsen (1966) states that E. truncatum is found "throughout Tropical Asia" and in regard to its chromosomes he reports that "In several good plates the number $2n = 30$ was established. It is small chromosomes as in E. achiton. Erlandsson (1942) reports the numbers $n = 16$ and $2n = 29-32$ from Java."

Merrill (1921) cites Schlechter 13221 from Labuan, Winkler 3358 from Borneo, and Clemens & Clemens 9595 & 9698, Gibbs 2597 & 2602, Haslam s.n., and Topping 1478 & 1938 from Sabah. Van Royen (1959) cites Van Royen 3599, 3600, & 5822 from New Guinea. Arora (1968) describes the species as "common in sandy wet soil" and cites his no. 6778. Maximowicz (1893) cites Hance s.n. from Macao and from Canton, Wright s.n. from Hongkong, Cuming s.n. from Malacca, Thwaites s.n. from Ceylon, Heyne s.n. from India, Wight s.n. from Deccan, and Bélanger s.n. from Malabar.

Hooker & Thomson s.n. [Silhet, alt. 0] and T. Thomson s.n. [Plan. Ganget. Sup.] are both mixtures with E. cinereum R. Br., at least insofar as the Munich herbarium specimens are concerned; Thwaites 790 is in part E. truncatum and in part E. thwaitesii Körn.; T. Philippi s.n. in the Berlin herbarium is said to have been mixed with T. Philippi 18 [which is E. achiton Mart.] and was identified by Körnicke as E. truncatum var. α. Zollinger 1220 in the Berlin herbarium seems to have had its collection number corrected to "1210", but not clearly so. The E. Barnes B. 9a, Koorders 3949b, and Toroës 4441, cited below, were previously incorrectly cited by me as E. thwaitesii Körn.

Material of E. truncatum has been misidentified and distributed in herbaria under the names E. cinereum R. Br., E. lanceolatum Miq., E. longifolium Nees, E. luzulaefolium Mart., E. merrillii Ruhl., E. quinquangulare L., E. sexangulare L., E. sieboldianum Sieb. & Zucc., E. sieboldii S. & Z., E. sikokianum Maxim., E. thwaitesii Körn., E. truncatum var. malaccense Hook. f., E. xeranthemum Mart., Leucocephala spathacea Roxb., and Xyris microcephala Hassk. As an example of the confusion in herbaria, the Collector undesignated 2065 H.B. specimen, cited below, was identified by various workers in sequence as E. capitulum Miq., E. argenteum Mart., E. quinquangulare L., E. heterolepis Steud., E. luzulaefolium Mart., and E. heterolepis var. nigricans Körn.

On the other hand, the Loher 13901 and Verterdal 465, distributed as E. truncatum, are actually E. cinereum R. Br., Hosseus 117 and Meebold 10320 are E. dianae Fyson, Hosseus 102 is E. dianae

var. longibracteatum Fyson, Shantha 68 is E. humile Moldenke, Hosseus 492 and Lindhard s.n. [8 Jan. 1904] are E. luzulaefolium Mart., H. H. Bartlett 7457, Bünnemayer 5203, and Loher 12947 are E. merrillii Ruhl., Chang & En 2907 is E. robustius (Maxim.) Mak., Chung 2711, 3747, & 3825, Herb. Lingnan Univ. 17173, Tai 11617, and Tak 424 are E. sexangulare L., Chang & Metcalf 163 is E. sollyanum Royle, and Lindhard 20 is E. soucherei Moldenke, while M. Ramos s.n. [Herb. Philip. Bur. Sci. 41340] is in part E. echinulatum Mart., in part E. infirmum var. puberulentum (Moldenke) Van Royen, and in part something non-ericaulaceous.

Citations: PAKISTAN: East Bengal: W. Griffith 5566 (C), 5576 (Cp); Hooker & Thomson s.n. [Chittagong, alt. 0-1000 ped.] (Mu-260), s.n. [Silhet, alt. 0] (Mu-247). INDIA: Assam: H. Bruce 18 (Br); Collector undesignated 129 (S); Herb. Bot. Surv. India s.n. [27.9.56] (Mu); Wallich 6071, in part (B). Bihar: Hamilton s.n. [Wallich 2368] (B-type, N-isotype, N-photo of type, Z-photo of type); Wight 2368 (B). Bombay: Santapau 10853 (Xa), 15897 (Xa). Kerala: E. K. Janaki 467 (Mi). Khasi States: Hooker & Thomson s.n. [Mont. Khasia, 0-6000 ped.] (Mu-215). Madras: E. Barnes N.9a (F-photo, K, N, N-photo, Sg-photo, Z-photo); Iyengar 80 (Bn-3157). Mysore: Begum 3 (Mf); E. K. Janaki 328 (Mi); S. N. Ramaswamy 5 (Rf); Sivan 30 (Bn-3151). Saurashtra: Santapau 16362 (Xa, Z), 16363 (Xa). Uttar Pradesh: Strachey & Winterbottom 2 (Br). West Bengal: J. W. Helfer 136 (B, Go, N, S); Hooker & Thomson 5 (B). State undetermined: T. Thomson s.n. [Plan, Ganget. Sup.] (Mu-248). CEYLON: Börjesen s.n. [Kandy, 11/3/1928] (Cp); Thwaites 790, in part (B, Br), C.54 (N). BURMA: Tenasserim: T. Philippi s.n. (B). CHINA: Anhwei: R. C. Ching 4449 [Herb. Univ. Nanking 8829] (Ca-263145). Chekiang: Faber 206 (N). Fukien: Chang & En 2926 (Mu); C. H. Cheng 3042 (Ca-299325, Mu). Hupeh: Sun 851 (N). Kiangsu: Chiao s.n. [Herb. Univ. Nanking 22344] (Ws). Kweichow: Steward, Chiao, & Cheo 441 (S, W-1659105). CHINESE COASTAL ISLANDS: Honam: E. D. Merrill 9830 (Ca-291720). THAILAND: Franck 184 (Cp), 1463 (Cp); Hansen, Seidenfaden, & Smitinand 11098 (Cp); Sørensen, Larsen, & Hansen 3122 (Cp), 3830 (S), 5345 (S), 5626 (S), 5899 (Cp). INDOCHINA: Tonkin: Pételot 8093 bis (N). MALAYA: Malacca: W. Griffith s.n. [Malacca] (B). Singapore: H. N. Ridley 3920 (Ca-266913, Ca-267662). WESTERN PACIFIC ISLANDS: JAPAN: Kiushiu: Ichikawa 200846 (Ca-320869). PHILIPPINE ISLANDS: Luzon: Bacani s.n. [Herb. Philip. Forest. Bur. 16458] (W-709525); M. S. Clemens 18023 (Ca-295830); Loher s.n. [Rizal Province, Dec. 1910] (Ca-229618), s.n. [Rizal Province] (Ca-229619); C. B. Robinson s.n. [Herb. Philip. Bur. Sci. 9500] (W-629616). Island undetermined: Cuming 2326 (B, Mu-344). INDONESIA: GREATER SUNDA ISLANDS:

Borneo: H. Hallier 1172, in part (Ca--265588). Java: Bakhuizen van den Brink 67 (Ut--59770), 2336 (Ut--25479a); Blume s.n. (N); Hackenberg 3 (Bi); H. Jensen s.n. (Cp); Karta 317 (N); Koorders 39495b (Ca--308145); E. O. A. Nyman s.n. [Buitenzorg, 25.VIII. 1897] (Gg--401154); Savinierre 1663 (Br); Teijsmann s.n. (Ut--322); Zollinger 1220 (B), 1920 (Ca--348903). Sabah: Clemens & Clemens 29706 (N). Sarawak: Clemens & Clemens 20528 [field no. 6559] (N), 20997 [field no. 7616] (N). Sumatra: Boesa 6688 (Mi, W--1861523), 7403 (Mi, W--1861574), 7468 (Mi), 8007 (Mi, W--1682390), 8642 (Mi), 8764 (Mi); Toroos 2581 (Mi, N), 2895 (Mi), 2995 (W--1680084), 4441 (S, W--1680840, W--1680841), 4572 (Bi, N), 5024 (Bi, N). CULTIVATED: Java: Slooten s.n. [Buitenzorg, 1937] (S). LOCALITY OF COLLECTION UNDETERMINED: Collector undesignated 2065 H.B. [Sianja] (Ut--320).

ERIOCAULON TRUNCATUM var. DISEPALUM Fyson

Synonymy: Eriocaulon truncatum var. di-sepalum Fyson, Journ. Indian Bot. 2: 199. 1921.

Bibliography: Fyson, Journ. Indian Bot. 2: 199. 1921.

Fyson (1921) proposed this variety for the many specimens identified as E. truncatum Hamilt. which have female florets with only 2, instead of 3 sepals. He does not indicate a type, but says merely "Female sepals 2, otherwise as in the type. The wider distribution given for the species", i.e., "Bengal, Assam, North Burma and southwards to Malacca; S. India and Ceylon", except for the Tipperah, in the mountains of Monghir in the region of Bihar, India, where the type of the 3-sepaled form of E. truncatum was collected by Hamilton. He notes that in the Calcutta herbarium there are two sheets which have three types of female florets in the same head, with 2 sepals only, with 3 equal sepals, and with 2 boat-shaped and one linear sepal. It is not clear from his discussion how he intended to identify these two specimens. All other authors record only 2 sepals for the pistillate florets of E. truncatum Hamilt., although Kunth (1841) adds the comment "potius 3, duo cohaerentia?".

ERIOCAULON TRUNCATUM var. MALACCENSE Hook. f.

Bibliography: Hook. f., Fl. Brit. Ind. 6: 578. 1893; Milne-Redhead in Hook., Icon. Pl. 34: pl. 3389. 1939; Moldenke, Known Geogr. Distrib. Erioc. 26 & 41. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 138, 139, & 206. 1949; Moldenke, Résümé 180 & 483. 1959.

Hooker (1893) describes this variety as follows: "floral bracts broader, flowers of both sexes sessile, petals broader and more coriaceous, gland apical, ovary with petals stipitate, seeds larger. — Malacca, Griffith (Kew Distrib. 5567); at Kwala Pahang, Ridley. — Possibly a different species."

The H. N. Ridley 3920, distributed as this variety, is cited

by me in this series of notes under typical E. truncatum Hamilt.

ERIOCAULON TRUNCATUM var. **QUADRICOSTATUM** H. Lecomte

Synonymy: Eriocaulon truncatum var. quadricostata H. Lecomte, Not. Syst. 2: 214. 1912.

Bibliography: H. Lecomte, Not. Syst. 2: 214 (1912) and 2: 393. 1913; Moldenke, Known Geogr. Distrib. Erioc. 26 & 41. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 136 & 206. 1949; Moldenke, Résumé 176, 293, & 483. 1959.

Lecomte (1912, 1913) spells the varietal epithet for this taxon "quadricostata" on page 214 and as "quadricostatum" on page 393 of his work, describing the plant as "hampe à quatre côtes, capsules sphériques. -- Annam: Djiring à Phan-tiet, no. 1596 [Lecomte et Finet]."

ERIOCAULON TUBIFLORUM Van Royen

Synonymy: Eriocaulon brevipedunculatum var. angustifolium Moldenke, Phytologia 4: 127--128. 1952.

Bibliography: Moldenke, Phytologia 4: 127--128. 1952; Moldenke, Biol. Abstr. 27: 984. 1953; Moldenke, Bull. Jard. Bot. Brux. 27: 131. 1957; Van Royen, Nov. Guin., new ser., 10: 23, 36--37, & 44, fig. 4 S. 1959; Moldenke, Résumé 201 & 480. 1959; Moldenke, Résumé Suppl. 1: 14. 1959; Van Royen, Blumea 10: 128. 1960; Moldenke, Phytologia 17: 453 (1968) and 19: 21. 1969.

Illustrations: Van Royen, Nov. Guin., new ser., 10: 36, fig. 4 S. 1959.

Van Royen (1959) describes this species as follows: "Herb up to 3 cm, forming dense cushions. Leaves linear, 0.5--2 by 0.05--0.15 cm, acute, 4- or 5-nerved, fenestrate, glabrous but with long white hairs in the axil. Peduncles 1--3 cm. long, 4- or 5-ribbed, glabrous, sheath 6--8 mm long, glabrous. Heads obovoid or ellipsoid, 2--2.5 by 2--3 mm, involucre bracts suborbicular or elliptic, 1.7--2.2 by 1--2 mm, rounded, glabrous, floral bracts obovate, 2--2.2 by 1--1.5 mm, rounded, glabrous; receptaculum with few long white hairs. ♂ Flowers: sepals 3, tubuliformly united, but the lateral ones united up to 2/3 only, boatshaped, obovate, 2--2.5 by 0.7--1 mm, median one flat, all sepals obtuse, glabrous, blackish in upper half; petals 3, tubuliformly united, sometimes with a few white hairs at apex, with a black gland at inside; stamens 6, anthers black. ♀ Flowers: sepals 3, tubuliformly united, boatshaped, c. 3 mm long, acute or obtuse, blackish except for the apex, glabrous; petals 3, free, oblanceolate, 1.8--2 mm long, acute, with a black gland below the apex and white hairs at inside; ovary 3-celled; style 1 with 3 branches. Seeds ellipsoid, with a large number of transverse rows of small hairs. Distribution. Endemic. Local distribution. North Central New Guinea, Nassau Range, near Lake Habbema, alt. 3225 m (Brass 9288, 9318, both in A, L and NY). Ecology. In boggy grasslands, on edges of pools and in bogs at high altitudes. Remarks. Originally this species (based on Brass 9288) has been described as a variety of E. brevipedunculatum Merrill, but she

differs from that species in the connate, glabrous and suffused black sepals. These details warrant this variety to be regarded as a separate species. The combination E. angustifolium (Koernicke, 1863) exists already and therefore the specific epithet tubiflorum is chosen referring to the connate sepals".

Collectors have found this species at altitudes of 7000 to 9675 feet, flowering and fruiting in August, describe its inflorescence as "black", and found it growing "amphibious in bogs and pools, boggy marshes and open alpine places".

The M. S. Clemens 5584 & 9368, previously cited by me in this series of notes as this taxon, have recently been shown to represent E. alpinum Van Royen instead, while Brass 9231 & 9282 and Brass & Meyer-Drees 9997 are E. pulvinatum Van Royen.

Emended citations: MELANESIA: NEW GUINEA: Dutch New Guinea: Brass 9288 (N-type), 9318 (N). Northeastern New Guinea: M. S. Clemens 5655a (B).

ERIOCAULON UBONENSE H. Lecomte

Synonymy: Eriocaulon ubonensis H. Lecomte apud Koyama, Philip. Journ. Sci. 84: 378, sphalm. 1956.

Bibliography: H. Lecomte, Journ. de Bot. 21 [sér. 2, 1]: 89, 92, 103, & 109, fig. 1. 1908; H. Lecomte, Fl. Gén. Indo-Chin. 7: 2 & 11—12. 1912; Prain, Ind. Kew. Suppl. 4, pr. 1, 82 (1913) and pr. 2, 82. 1938; Moldenke, Known Geogr. Distrib. Erioc. 26, 41, & 61. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 136, 137, & 206. 1949; Koyama, Philip. Journ. Sci. 84: 373—375 & 378, pl. 6 C ["5" C]. 1956; Moldenke, Résumé 176, 178, & 483. 1959.

Illustrations: H. Lecomte, Journ. de Bot. 21: 103, fig. 1. 1908; Koyama, Philip. Journ. Sci. 84: pl. 5 C. 1956.

This species is based on Thorel 1593, in part, from Ubon, Mekong, Annam, and Pierre s.n. from Cambodia. Lecomte (1908) comments that "Cette plante diffère de E. longicuspis Hook. f. par la structure de ses feuilles à cloisons transversales beaucoup plus rapprochées, par les bractées florales qui sont villeuses dorsalement près du sommet, mais qui ne sont pas acuminiées, par la hampe qui est plus courte et beaucoup moins forte, etc."

Koyama (1956) cites B. Hayata s.n. from Thailand. Before that the species was known only from Annam and Cambodia. Koyama's paper is dated "1955", but was actually not issued until 1956. In it he cites Lecomte's original publication as "H. Lecomte in Morot. Journ. Bot." which is an alternative manner of citing the "Journ. de Bot." (originally edited by Louis Morot) to distinguish it from the equally famous English "Journ. Bot." He comments that "This is a large-sized fine Eriocaulon well characterized by flaccid thick leaves and large heads composed of dark gray floral bracts and densely bearded white disk flowers. This taxon is known only from Indo-China and Thailand. We have very little taxonomical data on Eriocaulon from Thailand. Only two species are represen-

ted by herbaria from Thailand. They are the present species and E. glabriflorum, the latter one being first reported from Malay Peninsula by Ridley." It should be noted that now 31 species and one variety of Eriocaulon are known from Thailand -- an indication of how rapidly our knowledge of this group has increased during the last decade..

ERIOCAULON ULAEI Ruhl.

Synonymy: Eriocaulon ulaei Ruhl. ex Moldenke, Résumé Suppl. 1: 18, in syn. 1959.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 4, 17, 18, 42, 47, & 287. 1903; Prin, Ind. Kew. Suppl. 3: 70. 1908; Moldenke, Known Geogr. Distrib. Erioc. 8 & 41. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 77 & 206. 1949; Moldenke, Résumé 89, 417, & 483. 1959; Moldenke, Résumé Suppl. 1: 6 & 18. 1959.

Citations: BRAZIL: Rio de Janeiro: Ule 1315 [Macbride photos 10566] (B--type, N--photo of type, W--photo of type, Z--isotype).

ERIOCAULON ULAEI var. RADIOSUM Ruhl.

Synonymy: Eriocaulon ulaei var. radiosa Ruhl. in Engl., Pflanzenreich 13 (4-30): 48 & 287. 1903.

Bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 48 & 287. 1903; Moldenke, Known Geogr. Distrib. Erioc. 8 & 41. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 77 & 206. 1949; Moldenke, Résumé 89, 293, & 483. 1959; Moldenke, Résumé Suppl. 1: 6. 1959.

This taxon is known thus far only from the type collection.

Citations: BRAZIL: Santa Catarina Island: Ule 639 (B--type, Z-isotype).

ERIOCAULON USSURIENSE Körn.

Bibliography: Regel, Tent. Fl. Ussur. 157. 1861; Maxim., Diagn. Pl. Nov. Asiat. 8: 6 & 16. 1893; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 879. 1893; Komarov, Fl. Mansh. 1: 419. 1901; Ruhl. in Engl., Pflanzenreich 13 (4-30): 66, 100, & 288. 1903; Komarov & Alis., Oprod. Rast. Dal'nevost. Kr. 1: 340. 1931; Steinberg in Komarov & Schischkin, Fl. U. S. S. R. 3: 496-497, pl. 27, fig. 5 a & b. 1935; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 879. 1946; Moldenke, Known Geogr. Distrib. Erioc. 20, 24, & 41. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 108, 130, & 206. 1949; Moldenke, Phytologia 3: 469. 1951; Moldenke, Résumé 132, 167, & 483. 1959; Moldenke, Résumé Suppl. 1: 8. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 879. 1960; Steinberg in Komarov & Schischkin, Fl. U. S. S. R., Engl. transl., 3: 393-394. 1964.

Illustrations: Steinberg in Komarov & Schischkin, Fl. U. S. S. R. 3: pl. 27, fig. 5 a & b. 1935.

Maximowicz (1893) cites only Maack s.n. from Lake Hanka in Manchukuo. He notes that "Habitu nostratibus E. kiusiano m. v. E. alpestris Hk. f. et Th. exemplis typicis angustifoliis simile, l.

c. fusius descriptum. Bracteae florales 2 mm. longae florem ♀ paulo excedentes ♂aequantas."

Additional citations: UNION OF SOCIALIST SOVIET REPUBLICS: Far Eastern Territory: Melvil s.n. [31/VIII/1926] (N—photo, Z—photo). Siberia: Collector undetermined 2373 (N, S), s.n. [5.IX. 1950] (Go); Kiss s.n. [Primorskaja, 15.VIII.1917] (Mi). South Ussuria: Kusnezow 179 (N).

ERIOCAULON VANHEURCKII Muell.-Arg.

Synonymy: Eriocaulon van heurckii Muell.-Arg. apud Ruhl. in Engl., Pflanzenreich 13 (4-30): 103, 105, & 288. 1903. Eriocaulon thomasi Fyson, Journ. Indian Bot. 1: 50 (1919) and 2: 318. 1921. Eriocaulon vanheureckii Muell.-Arg. apud Razi, Journ. Mysore Univ. 7 (4): 77, sphalm. 1946. Eriocaulon indicum Moldenke, Phytologia 3: 163—164. 1949.

Bibliography: Muell. & Van Heurck in Van Heurck, Obs. Bot. 98. 1870; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 879. 1893; Ruhl. in Engl., Pflanzenreich 13 (4-30): 103, 105, & 288. 1903; Fyson, Journ. Indian Bot. 1: 50 (1919), 2: 318 & 320 (1921), and 3: 18. 1922; A. W. Hill, Ind. Kew. Suppl. 6: 79 (1926) and 7: 89. 1929; C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. 1, 9: 1610—1611 & 1619. 1931; Moldenke, Known Geogr. Distrib. Erioc. 24, 41, & 61. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 879. 1946; Razi, Journ. Mysore Univ. 7 (4): 77. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 127, 128, & 206. 1949; Moldenke, Phytologia 3: 163—164 (1949) and 3: 328. 1950; Razi, Journ. Mysore Univ. 11 (1): 7. 1950; Moldenke, Phytologia 3: 470. 1951; E. J. Salisb., Ind. Kew. Suppl. 11: 88. 1953; C. E. C. Fischer in Gamble, Fl. Presid. Madras, ed. 2, 8 [3]: 1122—1123, 1127, & 1333. 1956; Moldenke, Résumé 163, 165, 289, 293, & 483. 1959; Razi, Rec. Bot. Surv. India 18: 19 & 20. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 879. 1960; Moldenke, Résumé Suppl. 3: 17. 1962; G. L. Shah, Bull. Bot. Surv. India 4: 237. 1962; Thanikaimoni, Pollen & Spores 7: 186. 1965.

Illustrations: Fyson, Journ. Indian Bot. 2: pl. 41. 1921.

The type of E. indicum is Santapau 2924 from Khandala, on the Kuve Plateau, India, collected on October 4, 1943, and deposited in the Britton Herbarium at the New York Botanical Garden. Eriocaulon thomasi is based on Meebold 9104 & 9899 in the Calcutta herbarium. Fyson's description (1921) of it is worth repeating here: "Habitu speciei E. Thwaitesii Hook. f. similis, sed capitulum globosum, involucri reflexum, sepal duo. Caulis per-brevis. Folia caespitosa, lanceolata acuta, mucronata, glabra, 5—10 cm. longa, 0.4 to 1.0 cm. lata. Pedunculi paulo ad duplici longiores, glabri; sub-capitulo paulo crassi. Capitula globosa. Bractae involucri breviae, reflexae. Bractae flores superantes rhomboidoecuneata summodorso puberulae. Flos ♂ sepal 2, naviculari-concava; petala 3, angustissima linearia, longis pilosis barbata magnis glandulis instructa. Semina, oblonga, fusca. Flos ♀ sepal 2, angusta; petala 3; antherae nigrae.....Peninsular India;

on the Western Ghats, Salsette, Khandala, Castle Rock, Tirthalli! Stems tufted. Leaves glabrous, lanceolate or oblanceolate acute or mucronate. 2—5 in. by $1/3$ in. at widest. Scapes twice as high or less, thickened below the very globose or truncate heads, which are white by the thickly puberous exposed back of the floral bracts. Receptacle tall hairy. Sepals in both sexes 2 only; deeply boat-shaped and thickened along the keel. Female petals linear with long basal hairs. Anthers black. A very distinct species, allied probably to E. sexangulare L. but with the keel of the female sepals less developed. The slight but distinct thickening of the peduncle just below the head is very striking."

Santapau describes the species as "locally abundant in rock pools", growing to 20 cm. tall, while Shah says that it is "common, forming large patches on rocks during rains". Razi (1950) records it from Mysore and (1959) from Travancore. It has been collected in flower and fruit in August and September.

Citations: INDIA: Bombay: Blatter, Hallberg, & McCann 28071 (N); R. R. Fernandez R.299 (Xa); Herb. Blatter 2372 (N, Xa), 2373 (N, Xa), 2566 (N, Xa); Santapau 470a (N, Xa), 2183 (N, Xa), 2924 (N), 4843 (N, Xa), 10264 (N, Xa), 13025 (Xa), 14980 (Xa), 14988 (Xa), 15021 (Xa), 15844 (Xa), 15847 (Xa), 15907 (Xa), 15939 (Xa), 21167 (Xa), 21168 (Xa); G. L. Shah 340 (Xa), 4759 (Xa).

ERIOCAULON VANHEURCKII f. MINIMUM Moldenke

Bibliography: Moldenke, *Phytologia* 5: 84. 1954; Moldenke, *Résumé* 163 & 483. 1959.

This form differs from the typical form of the species in being in all only 3—4 cm. tall.

Citations: INDIA: Bombay: Santapau 15849 (Xa—type, Z—iso-type).

ERIOCAULON VAUPESENSE Moldenke

Bibliography: Moldenke, *Bot. Mus. Leaflet*. Harvard Univ. 18: 124. 1958; Moldenke, *Résumé* 66 & 483. 1959; G. Taylor, *Ind. Kew. Suppl.* 13: 52. 1966; Moldenke, *Phytologia* 19: 324. 1970.

A small probably annual herb; stem much abbreviated; leaves tufted, very thin-membranous and fragile, apparently erect when fresh, spreading or reflexed in age, linear and grass-like, uniformly pale-green on both surfaces, 3.5—6 cm. long, 1.5—2 mm. wide below the middle, attenuate-subulate at the apex, fenestrate, glabrous on both surfaces; peduncles usually one per plant, 7—14 cm. long, very slender or filiform, weak, stramineous, 3—5-costate, often green within the sulcations; sheaths slender, closely appressed, 2—2.5 cm. long, glabrous throughout, split at the apex, the blade about 5 mm. long, erect or the tip very slightly spreading, subulate-tipped, glabrous; heads small, white, 3—5 mm. wide; involucre bractlets obovate, thick-textured, stramineous, closely appressed and imbricate, about 1.6 mm. long and wide, shiny, rounded at the apex, glabrous; receptacular bractlets similar but appressed white-pilose on the back and shortly white-barbate toward and at the apex with stiffly erect hairs, yellowish, broadly round-

ed at the apex, firm, rigid, shiny; staminate florets: sepals 3, connate at the base, cuneate-spatulate, about 0.8 mm. long and 0.4 mm. wide, rounded and white-barbate at the apex with stiffly erect hairs; petals 3, connate into a slender stramineous tube about 0.8 mm. long, the free tips densely white-barbate like the sepals; stamens 6; filaments very short, about 0.16 mm. long, glabrous; anthers oblong, dark-brown, about 0.2 mm. long and 0.12 mm. wide; pistillate florets not seen.

The type of this species was collected by Richard Evans Schultes, Richard E. D. Baker, and Isidoro Cabrera (no. 18274) at Caño del Caribe (between Isla del Venado and San José) and vicinity, at an altitude of about 850--900 feet, Río Guainía, Vaupés, Colombia — at about latitude 2°45' N. and longitude 67°50' W., — on November 2, 1952, and is deposited in the United States National Herbarium at Washington. The plant has been misidentified and distributed in some herbaria as E. atabapense Moldenke.

Citations: COLOMBIA: Vaupés: Schultes, Baker, & Cabrera 18274 (W--2172096--type, Z--isotype).

ERIOCAULON VITTIFOLIUM H. Lecomte

Bibliography: H. Lecomte, Bull. Soc. Bot. France 55: 645--646. 1909; Prain, Ind. Kew. Suppl. 4, pr. 1, 82 (1913) and pr. 2, 82. 1938; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 127 & 133--137, fig. 1, pl. 7, fig. 6--9 (1955) and 67: 89. 1957; Moldenke, Résumé 136, 147, & 483. 1959; Moldenke, Résumé Suppl. 1: 9 (1959) and 3: 16. 1962; Moldenke, Phytologia 18: 259. 1969.

Illustrations: H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 127, fig. 1, & pl. 7, fig. 6--9. 1955.

Hess (1955) gives a very detailed description of this species, with illustrations, and makes the following interesting comments: "Lecomte.....hat Eriocaulon vittifolium aus französisch Guinea beschrieben. Seither wurde die Art meines Wissens nie mehr zitiert. In Angola fand ich zwei Fundorte von Eriocaulon vittifolium. Weil die Unterschiede gegenüber E. latifolium Sm. aus den Diagnosen nicht klar hervorgehen, habe ich das Typus-Material von E. vittifolium aus dem Muséum National d'Histoire Naturelle, Paris, und das Original-Material von E. latifolium aus dem Herbarium Kew miteinander verglichen.

"In der Diagnose von Eriocaulon vittifolium sind keine Angaben über Abmessungen in den Blüten zu finden. Die Diagnose wird hier, gestützt auf das Original-Material, das von Dr. Macclaud bei Dinguevay (Nov. 1898) und von A. Chevalier bei Kindia, Nr. 12787, gesammelt wurde, neu gefasst und mit dem Material aus Angols verglichen, welches aber noch keine reifen Früchte besitzt. Weiter wird im Anhang zum Vergleich auf die Morphologie von E. latifolium Sm. eingegangen.....

"Eriocaulon vittifolium wurde am beiden Stellen in schnell fließendem Wasser gefunden. Die Wassertiefe betrug (nach Mitte der Trockenzeit) 20--50 cm. Der Grund ist kiesig. Als Begleiter ist einzig Boottia sp. zu nennen.....

"Vergleicht man die ♀ Blüten von Eriocaulon vittifolium von Dinguevay mit denen aus Kindia (Nr. 12787), so glaubt man, es mit zwei ganz verschiedenen Arten zu tun zu haben. Die Sepalen der Blüten aus Dinguevay sind spitz, undeutlich gekielt, um 1,8 mm lang. Die Petalen sind meist spitz, gelegentlich abgerundet, so lang wie die Sepalen und 0,4--0,5 mm breit. Die Blüten aus Kindia haben nur um 1,5 mm lange, aber etwa 1 mm breite, gestutzte, nicht spitze Sepalen; sie sind zudem tief konkav und auf dem Rücken rund. Die Petalen sind an der stets breit abgerundeten Spitze um 0,6 mm breit. Es würde sich deshalb scheinbar rechtfertigen, zwei Arten zu unterscheiden. Nun habe ich aber aus dem Conservatoire Botanique de Genève noch eine Pflanze untersucht, die mit Eriocaulon latifolium angeschrieben ist, aber zweifellos zu E. vittifolium gehört. Sie stammt ebenfalls aus Kindia und wurde dort von Roberty (Nr. 10747) am 14.2.1948 gesammelt. Diese Pflanze hat nun Sepalen in den ♀ Blüten, die etwa so breit sind wie die der Nr. 12787 aus Kindia; sie sind aber zugespitzt. Weiter gibt es an diesen Blüten auch schmalere und spitze Sepalen. Die Petalen haben meist die Form wie bei Nr. 12787; es gibt aber auch schmalere mit stumpfer Spitze. Nach diesem Material zu schließen, ist eine Unterteilung der Art Eriocaulon vittifolium nicht gerechtfertigt. Die Untersuchung eines umfangreichen Materials kann vielleicht zu andern Ergebnissen führen.

"Wie bereits gesagt, haben die Pflanzen aus Angola noch keine reifen Früchte; ein genauer Vergleich mit dem Original-Material ist also nicht möglich. Die Form der Sepalen und Petalen der ♀ Blüten stimmt mit denen an den Pflanze aus Dinguevay überein. Die Petalen sind in diesem Entwicklungsstadium noch etwas länger als die Sepalen.....

"Eriocaulon vittifolium ist aus zwei Gebieten in französisch Guinea bekannt (Dinguevay und Kindia). Die neuen Fundorte in Angola sind ca. 150 km voneinander entfernt.....

"Eriocaulon vittifolium ist noch gegen die verwandten Arten E. latifolium Sm. und E. Thunbergii Wikstr. abzugrenzen, die beide aus Sierra Leone angegeben sind. Von E. latifolium habe ich das Original-Material untersucht, das von Barter bei Vatemba Road gesammelt wurde (aus Herbarium Kew):.....Der Vergleich der beiden Diagnosen zeigt, dass die Arten gut getrennt sind: E. latifolium bildet keinen Stengel; die Brakteen sind nur $1/3$ bis $1/2$ so lang wie bei E. vittifolium; die Sepalen sind weiss und sehr lang behaart, ebenso die Petalen. In den ♀ Blüten sind die Drüsen meist rückgebildet oder fehlen; in den ♂ Blüten sind sie aber stets vorhanden.

"Von Eriocaulon Thunbergii Wikstr. habe ich kein Material gesehen; bei diese Art sollen die Drüsen in den ♀ Blüten immer fehlen, in den ♂ Blüten aber vorhanden sein. Die Petalen seien wenig behaart." He cites H. Hess 50/237 from Benguela and 52/2146 from Huila, Angola.

In his 1957 work Hess records E. vittifolium also from Congo.

This author dates the original publication of Lecomte as "1908", but the pages here involved actually were not issued until 1909. Fanshawe describes the plant as an "aquatic with only the heads showing above water". It has been found growing at altitudes of 1450 to 1700 meters, flowering in July and August. It is sometimes infested by the fungus, Tolyposporium eriocauli Clint.

Citations: ANGOLA: Benguela: H. Hess 50/237 (B, Z). ZAMBIA: Fanshawe F.3532 (B).

ERIOCAULON VOLKENSII Engl.

Bibliography: Engl., Pflanzenw. Ost-Afr. C: 133. 1895; Ruhl. in Engl., Bot. Jahrb. 27: 72 & 82. 1899; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 158. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 2, 63, 71, 82, & 288, fig. 8A. 1903; Engl. & Drude, Veget. Erde 9 (2): 263. 1908; Stapf, Ind. Lond. 3: 91. 1930; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 40. 1930; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 2, 158. 1941; Moldenke, Known Geogr. Distrib. Erioc. 21 & 41. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 116, 117, & 206. 1949; Moldenke, Phytologia 3: 470. 1951; Hedberg, Symb. Bot. Upsal. 15 (1): 60--61 & 263. 1957; Moldenke, Résumé 143, 144, 146, & 483. 1959; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 158. 1959; Moldenke, Résumé Suppl. 1: 15, 18, & 25. 1959; Hedberg, Webbia 19: 526. 1965; Moldenke, Phytologia 19: 95 & 96. 1969.

Illustrations: Ruhl. in Engl., Pflanzenreich 13 (4-30): 71, fig. 8A. 1903; Engl. & Drude, Veget. Erde 9 (2): 263. 1908.

Rauh notes concerning his collection, cited below: "Pflanze kleiner als 532; Blätter graugrün; Köpfchen sitzend". He found it growing in swampy places at 3000 meters altitude. It has been found at altitudes of 2500 to 3900 meters, flowering from January to March, July, and September. It is based on Volkens 2032 from Kibo, on the north slope of Mt. Kilimanjaro, at 3400 meters altitude, deposited in the herbarium of the Botanisches Museum in Berlin, with duplicates at Brussels and Kew. Hedberg (1957) describes the plant as a "Scapigerous perennial herb. On moist ground in fens and along streams" and states that it is only known from Kilimanjaro, Aberdare, the Cherungani Hills, and Mt. Kenya. He cites Battiscombe 834 (K), Dale 3262 (K), Fries & Fries 1226 (K, S, Us), 1226a (Us), 2393 (S, Us), 2584 (K, Us) from Kenya, and Schlieben 4923 (Br, P, S) and Volkens 2032 (Br, K) from Tanganyika. He comments that "Eriocaulon volkensii Engl. seems to be the only species of this very critical genus reaching the alpine belt in Tropical East Africa, though it is usually confined to the ericaceous belt and the upper part of the montane forest belt. It must be closely related to E. schimperii Körn. and E. friesiorum Bullock, which also reach fairly high levels, although they have not been recorded higher than 3450 m and 3100 m, resp."

Goetze 293 is a mixture with E. mesanthemoides Ruhl.

Additional citations: TANZANIA: Tanganyika: Goetze 293, in part (B); Schlieben 4923 (Mu, S). KENYA: Fries & Fries 1226 (S), 2393

(S); Rauh 532a (Mu). MOUNTED ILLUSTRATIONS: Engl., Pflanz. Reich 13 (4-30): 71, fig. 8 A (B).

ERIOCAULON WALKERI Hook. f.

Synonymy: Eriocaulon quinquangulare var. argenteum Thwaites apud Ruhl. in Engl., Pflanz. Reich 13 (4-30): 86 & 287. 1903. Eriocaulon quinquangulare var. walkeri Hook. f. apud Fyson, Journ. Indian Bot. 2: 204. 1921.

Bibliography: Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 1, 341. 1864; Hook. f., Fl. Brit. Ind. 6: 583. 1893; Hook. f. in Trimen, Handb. Fl. Ceylon 5: 2, 9, & 412. 1900; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 158. 1902; Ruhl. in Engl., Pflanz. Reich 13 (4-30): 64, 86, 287, & 288. 1903; Fyson, Journ. Indian Bot. 2: 204. 1921; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 2, 158. 1941; Moldenke, Known Geogr. Distrib. Erioc. 24, 39, & 41. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 130 & 206. 1949; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 158. 1959; Moldenke, Résumé 167, 291, & 483. 1959; Van Royen, Blumea 10: 135. 1960; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 2, 341. 1964; Moldenke, Phytologia 18: 434. 1969.

Fyson (1921) says: "Var. b. Walkeri Hook. f. F. B. I. vi 583, No. 39; Ruhl. No. 123. Very similar to E. quinquangulare vera but differing in the much more hairy receptacle and other parts. Ceylon. This should certainly be considered only a variety, for although Hooker in the F. B. I. states it to be a very distinct species, the type sheet in the Ceylon Herbarium is almost, if not exactly, matched by Clarke's No. 20849, collected in Bengal, and intermediates occur."

Material of E. walkeri has been misidentified and distributed under the name, E. argenteum Mart.

Citations: CEYLON: Thwaites C.P. 3562 (B--isotype, Z--isotype).

ERIOCAULON WELWITSCHII Rendle

Synonymy: Eriocaulon pseudopygmaeum Dinter in Fedde, Repert. Sp. Nov. 17: 260. 1921. Eriocaulon welwitschii Rendle apud H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 270, sphalm. 1955. Eriocaulon pseudopygmaeum Dinter ex Moldenke, Résumé Suppl. 1: 17, in syn. 1959.

Bibliography: Rendle, Cat. Afr. Pl. Welw. 2 (1): 97-98. 1899; Fritsch, Bull. Herb. Boiss., sér. 2, 1: 1105. 1901; Ruhl. in Engl., Pflanz. Reich 13 (4-30): 66, 99, 102, 281, & 288, fig. 13 D. 1903; Thiselt.-Dyer, Ind. Kew. Suppl. 2: 70. 1904; Engl. & Drude, Veget. Erde 9 (2): 265. 1908; Dinter in Fedde, Repert. Sp. Nov. 17: 260. 1921; A. W. Hill, Ind. Kew. Suppl. 7: 89. 1929; Stapf, Ind. Lond. 3: 91. 1930; Moldenke, Known Geogr. Distrib. Erioc. 22 & 42. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 118 & 206. 1949; H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 161 & 270. 1955; Moldenke, Résumé 147, 149, 153, & 483. 1959; Moldenke, Résumé Suppl. 1: 10, 17, 18, & 25 (1959) and 3: 15 & 16. 1962; Friedrich-Holzhammer in Merxmüller, Prodr. Fl. Sudw. Afr.

159: 2. 1967; Moldenke, Phytologia 17: 389 (1968), 19: 12, 17, & 97 (1969), and 19: 338. 1970.

Illustrations: Ruhl. in Engl., Pflanzenreich 13 (4-30): 99, fig. 13 D. 1903; Engl. & Drude, Veget. Erde 9 (2): 265. 1908.

Rendle (1899) regarded Dichrolepis pusilla Welw. as conspecific with E. welwitschii, but it is now regarded as a synonym of E. gilgianum Ruhl. instead. He states for E. welwitschii: "Near E. abyssinicum Hochst. but distinguished by its narrower and narrowly pointed bracts, markedly hairy receptacle, etc. Pungo Andongo. — Plentiful, but seen in one place only, in boggy scantily grassed places with species of Lythraceae between Lombe and Candumba. In fl. and immature fr. end of March 1857. No. 2441." His var. pygmaeum is now regarded as a synonym of E. aristatum H. Hess.

Hess (1955) says "Unter den unbestimmten Nummern von Eriocaulon lag ein Bogen mit Pflanzen, die am 10.3.1894 unter Nr. 4652 von R. Schlechter bei Bloumberg in Transvaal gesammelt wurden. Diese Exemplare gehören zu Eriocaulon Welwitschii Rendle. Die Art unterscheidet sich von der weit verbreiteten Eriocaulon abyssinicum Hochst. durch einen behaarten Blütenboden. Am Material von Nr. 4652 ist zwar die Behaarung nicht so dicht wie am Original-Material von Welwitsch (Nr. 2441 aus Angola, Pungo Andongo). Es finden sich aber sonst keine Unterschiede, somit sind die von R. Schlechter gesammelten Pflanzen zu E. Welwitschii zu stellen. Eriocaulon Welwitschii Rendle was bisher nur von einer Stelle aus Angola bekannt." In another place he states that E. welwitschii grows intermixed with E. gilgianum Ruhl. in Angola.

Milne-Redhead describes the species as follows: "minute annual, roots white, leaves pale-green, scapes erect and spreading, spathes and scapes pale-green, bracts scarious, dirty white, flowers gray, anthers black, in damp sandy ground at edge of Brachystegia-Uapaca woodland and boggy grassland" in Tanganyika. It has been found growing at altitudes of 990 to 1200 meters, flowering and fruiting in March and April.

Friedrich-Holzhammer (1967) cites only the type collection, Dinter 958, for E. pseudopygmaeum, and notes that this is a very poorly described taxon.

Material of E. welwitschii has been misidentified and distributed in herbaria as E. heudelotii N. E. Br. On the other hand, the Welwitsch 2441, distributed as E. welwitschii, is actually E. aristatum H. Hess.

Citations: MALI: Soudan: Jaeger 5247 (Gg). TANZANIA: Tanganyika: Milne-Redhead 9847 (B, S). ANGOLA: Loanda: Welwitsch 2441 (B-isotype, Mu-isotype, Z-isotype). RHODESIA: Wild 3791 [Govt. Herb. Salisbury 36007] (N). SOUTHWEST AFRICA: Dinter 958 (B, B, Z), 7220 (B, B). MOUNTED ILLUSTRATIONS: Engl., Pflanzenreich 13 (4-30): fig. 13 D (B).

ERIOCAULON WHANGII Ruhl.

Bibliography: Ruhl., Notizbl. Bot. Gart. Berlin 10: [1040]—1041 & 1060. 1930; A. W. Hill, Ind. Kew. Suppl. 8: 87. 1933; Moldenke, Known Geogr. Distrib. Erioc. 25 & 42. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 132 & 206. 1949; Moldenke, Résumé 170 & 483. 1959.

ERIOCAULON WIGHTIANUM Mart.

Synonymy: Eriocaulon sericans Heyne ex Mart. in Wall., Pl. Asiat. Rar. 3: 29. 1832 [not E. sericans Hook. f., 1894]. Eriocaulon sericans Mart. apud Steud., Nom. Bot., ed. 2, 1: 586. 1840. Eriocaulon sericans Mart. & Wall. ex D. Dietr., Syn. Pl. 5: 265. 1852. Eriocaulon wightianum Mart. & Wall. ex D. Dietr., Syn. Pl. 5: 265. 1852. Eriocaulon sericeus Mart. apud C. Müll. in Walp., Ann. 6: 1171, sphalm. 1861. Eriocaulon wightianum Meet. ex Moldenke, Known Geogr. Distrib. Erioc. 42, in syn. 1946. Eriocaulon pilosum Wall., in herb. [not E. pilosum Humb., 1959, nor Humb. & Bonpl., 1817, nor H.B.K., 1816, nor Kunth, 1822]. Eriocaulon wightianum Mart., in herb. Eriocaulon wightianum var. minus Mart., in herb.

Bibliography: Mart. in Wall., Pl. Asiat. Rar. 3: 28 & 29. 1832; Wall., Numer. List 207. 1832; Steud., Nom. Bot., ed. 2, 1: 586. 1840; Kunth, Enum. Pl. 3: 563, 568, & 614. 1841; D. Dietr., Syn. Pl. 5: 265. 1852; Steud., Syn. Pl. Glum. 2: [Cyp.] 271, 272, & 334. 1855; C. Müll. in Walp., Ann. 5: 926 & 942 (1860) and 6: 1171. 1862; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 1, 341. 1864; Hook. f., Fl. Brit. Ind. 6: 576—577. 1893; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 879 & 880. 1893; Hook. f. in Trimen, Handb. Fl. Ceylon 5: 2, 8—9, & 412. 1900; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 158. 1902; C. H. Wright, Journ. Linn. Soc. Lond. Bot. 36: 202. 1903; Ruhl. in Engl., Pflanzenreich 13 (4-30): 62, 75, 76, 285, 287, & 288. 1903; H. Lecomte, Journ. de Bot. 21: 109. 1908; Fyson, Journ. Indian Bot. 2: 262, 264, & 266, pl. 21 & 22. 1921; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 2, 158. 1941; Moldenke, Known Geogr. Distrib. Erioc. 24, 35, 40, & 42. 1946; Moldenke, Alph. List Cit. 1: 268. 1946; Razi, Journ. Mysore Univ. 7 (4): 77. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 879 & 880. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 125, 127, 129, 130, & 206. 1949; Moldenke, Phytologia 3: 470. 1951; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 158. 1959; Moldenke, Résumé 159, 163, 165—167, 288, 292, 294, & 483. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 879 & 880. 1960; Moldenke, Résumé Suppl. 3: 17. 1962; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 2, 341. 1964; Thanikaimoni, Pollen & Spores 7: 186. 1965; Moldenke, Résumé Suppl. 15: 20 (1967) and 17: 11. 1968; Moldenke, Phytologia 18: 82, 100, 102, 171, 178, 309, 342, & 352 (1969) and 19: 243, 244, 339, & 415. 1970.

Illustrations: Fyson, Journ. Indian Bot. 2: pl. 21. 1921.

According to Kunth (1841) this species is based on Wallich 6068 from "Moalmyne in Martabania", Burma, but he cites also Regnaud

s.n. from Pegu, Burma. He comments that "Huic speciei pro aliis habitu accedit E. decangulare Linn."

It is probably worth repeating Martius' description of E. sericans here: "Rhizomate annuo; scapis (spithamaeis) 7-angulis, pilosis, folia linearia acuminata glabra vaginasque ad medium apertas pilosulas quadruplo superantibus; capitulis hemisphaericis; bracteis involucribus testaceis, ellipticis; interioribus subrhombeis, acutis perianthisque albis et superne dense albo-barbatis." He based the species on W. Gomez 19 from Tavoy, Tenasserim, Burma -- a collection which is apparently also the type of E. pilosum Wall. and of E. wightianum var. minus Mart. Actually, this collection may be worth making the type of a variety because of its short leaves and small stature; if so, then Martius' varietal designation ought to be adopted for it.

Thwaites & Hooker (1864) actually describe, but do not name, another variety of this species: "var. capitulis nigro-cinereis, parce pilosis. -- C.P. 3382. Hab. Ambagamowa District", Ceylon.

Fyson's (1921) description of E. wightianum is as follows: "F. B. I. vi. 576, No. 17 in part; Ruhl. No. 92. Perennial (Mart.) Scapes 6--10 in. Leaves half as long, by 1/2 -- 3/4 in., slightly hairy; as also the scapes. Heads 1/2 in., globularly the reflexed involucre, snow white, with white floral bracts, the lower of which are nearly glabrous. Female petals ovate lanceolate distinctly clawed, with small or no gland, and spongy..... Burma. Moulmein etc. Tavoy. Hooker in F. B. I. l.c. included the Peninsular plant, E. robusto-brownianum Ruhl. in this species." Hooker (1893) also regarded E. gracile Mart. and E. infirmum Steud. as synonyms of what he called E. sericans Mart. Körnicke considered E. nilagirens Steud. as closely related to E. wightianum. Ruhland (1903) included var. helferi in the synonymy of E. wightianum and cites Kurz s.n., Stocks s.n., Wallich 6068a from India, Helfer 5584 from the Andaman Islands, and Thwaites 378 & 3382 from Ceylon. The initial letter of the specific epithet is, of course, very often uppercased by various authors.

It should be pointed out here that the E. wightianum credited to Hooker f. and referred to in the synonymy above, is in part E. brownianum Mart. and in part E. robusto-brownianum Ruhl. The E. sericans of Hooker is actually E. infirmum Steud. The E. pilosum variously credited to Humboldt, to Humboldt & Bonpland, to Kunth, or to Humboldt, Bonpland, & Kunth is a synonym of what is now known as Paepalanthus pilosus (H.B.K.) Kunth. Eriocaulon sexangulare Heyne, previously regarded as a synonym of E. wightianum, is based on Wallich 1827, a collection which is also given as the type of E. gracile Mart. -- now known as E. infirmum Steud.

Material of E. wightianum has been misidentified and distributed in herbaria under the name, E. wallichianum Mart. On the other hand, the Meebold 9734 and Ritchie 1244, distributed as E.

wightianum, are actually E. robusto-brownianum Ruhl., while Stocks, Law, etc. s.n. [Malabar, Concan &c.] is the type collection of E. wightianum f. viviparum Moldenke.

Additional citations: INDIA: Mysore: S. N. Ramaswamy 10 (Z). West Bengal: Helfer 135 (Go, N, S), 374 (Mu--374). CEYLON: Macrae s.n. [Lindley com.] (Br, Br, N, N, N--photo, Z--photo). BURMA: Tenasserim: Herb. Kummer s.n. [Moolmyne] (Mu--324); W. Gomez 19 (Br, N, N--photo, Z--photo); W. Griffith 5591 (C), s.n. [Moulmain] (W--1084791); Reynaud s.n. [Pegu] (B); Wallich 6067 (B, M), 6067a (B), 6068 (Br--isotype, N--photo of isotype, Z--photo of isotype).

ERIOCAULON WIGHTIANUM var. HELFERI Hook. f.

Synonymy: Eriocaulon helferi Hook. f., Fl. Brit. Ind. 6: 583. 1893.

Bibliography: Hook. f., Fl. Brit. Ind. 6: 583. 1893; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 158. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 76 & 285. 1903; Fyson, Journ. Indian Bot. 2: 266, pl. 22. 1921; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 2, 158. 1941; Moldenke, Known Geogr. Distrib. Erioc. 35. 1946; Moldenke, Résumé 166 & 484. 1959; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 158. 1959; Moldenke, Résumé Suppl. 15: 20. 1967.

Illustrations: Fyson, Journ. Indian Bot. 2: pl. 22. 1921.

Fyson (1921) says: "Var. Helferi Hook. f. (Helfer 1584 in Herb. Calc.) F. B. I. vi, 583 No. 38, Ruhl. l.c. A much smaller plant. Scapes 5--8 in., slender. Leaves 2--3 by 1/4 in., acute. Heads 1/4 in. Female petals shorter and broader than in the type. Plate 22. Andanans. Founded as a distinct species by Hooker but certainly a geographical form and reduced as such by Ruhland. He thus uses the varietal designation for this taxon, accredited to Hooker f., and avers that it was published in Fl. Brit. Ind. 6: 582, but actually Hooker there proposed it as a species, not as a variety. Fyson also says that Ruhland (1903) agrees in this disposition of varietal rank for the taxon, but actually Ruhland in his monograph reduces E. helferi to complete synonymy under typical E. wightianum and does not consider it a separate variety thereof. Fyson claims that the type is Helfer 1584, but Ruhland cites it correctly as Helfer 5584. Hooker (1893) actually says for the type and only collection that he cites: "Tenasserim, Helfer (Kew Distr. 5584)".

ERIOCAULON WIGHTIANUM f. VIVIPARUM Moldenke

Bibliography: Moldenke, Phytologia 18: 342. 1969.

Citations: INDIA: Kerala: Stocks, Law, &c. s.n. [Malabar, Concan &c.] (Mu--262--type, S--isotype).

ERIOCAULON WILLDENOVIANUM Moldenke

Synonymy: Eriocaulon longifolium Nees ex Kunth, Enum. Pl. 3: 567--568 & 613. 1841 [not E. longifolium Raf., 1840]. Eriocaulon

sexangulare Willd. ex Kunth, Enum. Pl. 3: 567 & 614, in syn. 1841 [not E. sexangulare Auct., 1903, nor Burm. f., 1826, nor Heyne, 1832, nor L., 1753, nor Mart., 1893]. Eriocaulon sexangulare var. longifolium (Nees) Hook. f., Fl. Brit. Ind. 6: 580. 1893. Eriocaulon sexangulare var. longifolium Hook. f. apud Ruhl. in Engl., Pflanzenreich 13 (4-30): 41 & 287. 1903. Eriocaulon longissimum Nees ex Usteri, Beitr. Kenntn. Philip. Veg. 131, hyponym. 1905. Eriocaulon longifolium Nees apud H. Lecomte, Fl. Gén. Indo-Chin. 7: 3, sphalm. 1912. Eriocaulon longissimum Nees ex Moldenke, Known Geogr. Distrib. Erioc. 36, in syn. 1946. Eriocaulon sexangulare Fyson ex Moldenke, Résumé 292, in syn. 1959. Eriocaulon longissimum Usteri apud Van Royen, Nov. Guin., new ser., 10: 24, in syn. 1959. Eriocaulon sexangulare Ridl. apud Van Royen, Nov. Guin., new ser., 10: 24, in syn. 1959. Eriocaulon longifolium "Nees ex Kunth" apud Punt, Reg. Veg. 36: 9. 1964.

Bibliography: Raf., Autikon Bot., pr. 1, 188. 1840; Kunth, Enum. Pl. 3: 567--568, 613, & 614. 1841; D. Dietr., Syn. Pl. 5: 265. 1852; Körn., Linnaea 27: 690. 1854; Steud., Syn. Pl. Glum. 2: [Cyp.] 268--269 & 334. 1855; C. Müll. in Walp., Ann. 5: 927 & 947. 1860; Körn. in Mart., Fl. Bras. 3 (1): 474. 1863; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 1, 341. 1864; Hieron. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 2 (4): 25 & 27. 1888; Hook. f., Fl. Brit. Ind. 6: 580. 1893; Maxim., Diagn. Pl. Nov. Asiat. 8: 28. 1893; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 878. 1893; Ruhl. in Engl., Bot. Jahrb. 27: 69, 73, & 580. 1899; Ruhl. in Engl., Pflanzenreich 13 (4-30): 13, 33, 40, 41, 106, 110, 286, & 287, fig. 5. 1903; Hochr., Ann. Conserv. & Jard. Bot. Genève. 11/12: 51. 1908; H. Lecomte, Bull. Soc. Bot. France 55: 571. 1908; H. Lecomte, Journ. de Bot. 21: 89--90, 94, 104, & 131. 1908; Koord., Exkursionsfl. Java 1: 273. 1911; H. Lecomte, Fl. Gén. Indo-Chin. 7: 2--4. 1912; H. Hallier, Beih. Bot. Centralbl. 34 (2): 45. 1916; E. D. Merr., Bibl. Enum. Born. Pl. 110. 1921; Fyson, Journ. Indian Bot. 2: 318 & 320. 1921; H. N. Ridl., Fl. Malay Penins. 5: 130. 1925; Ruhl., Notizbl. Bot. Gart. Berlin 10: 1042. 1930; Stapf, Ind. Lond. 3: 91. 1930; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 49. 1930; Erlandsson, Arkiv Bot. 30 B (2): 3 & 4. 1942; Raf., Autikon Bot., pr. 2, 188. 1943; Moldenke, Known Geogr. Distrib. Erioc. 22, 24--27, 36, & 40. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 878. 1946; Moldenke, Alph. List Cit. 2: 461 (1948) and 4: 1191. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 123, 129, 130, 132, 135, 136, 138, 139, 141, 142, 145--147, & 205. 1949; Moldenke, Phytologia 3: 330. 1950; E. J. Salisb., Ind. Kew. Suppl. 11: 88. 1953; Moldenke in Humbert, Fl. Madag. 36: 14, 15, & 19--21, fig. 2 (21--27). 1955; Moldenke, Résumé 156, 157, 165--167, 170, 174, 176, 180, 184, 186, 191--193, 196, 201, 289, 290, 292, & 481. 1959; Van Royen, Nov. Guin., new ser., 10: 23, 24, 32, 33, & 44, fig. 3 M. 1959; Moldenke, Résumé Suppl. 1: 13, 14, 17, & 18 (1959) and 2: 7. 1960; Van Royen, Nov. Guin., new ser., 10: 236. 1960; Moldenke, Biol.

Abstr. 35: 1688. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 878. 1960; Hocking, Excerpt. Bot. A.4: 592. 1962; Moldenke, Résumé Suppl. 3: 20 & 22--24 (1962), 7: 6 & 8 (1963), and 11: 6. 1964; Punt, Reg. Veg. 36: 9. 1964; Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 2, 344. 1964; Van Royen, Nov. Guin. Bot. 14: 467. 1965; Backer & Bakh., Fl. Java 3: 25. 1968; Moldenke, Résumé Suppl. 17: 5, 6, 10, & 11. 1968; Moldenke, Phytologia 18: 44 (1968), 18: 82, 309, & 433 (1969), 19: 18, 238, 242, 244, & 246 (1969), and 19: 325, 327, 339, & 477. 1970.

Illustrations: Ruhl. in Engl., Pflanzenreich 13 (4-30): 40, fig. 5. 1903; Koord., Exkursionsfl. Java 1: 273. 1911; Moldenke in Humbert, Fl. Madag. 36: 15, fig. 2 (21--27). 1955; Van Royen, Nov. Guin., new ser., 10: 32, fig. 3 M. 1959.

An acaulescent herb; leaves linear or grass-like, acute or submucronate at the apex, 12--70 cm. long, 2--4 mm. wide, membranous, often nigrescent, scarcely pellucid, much surpassing the sheaths, very lightly fenestrately many-veined; sheaths 5--11.5 cm. long, wide-spreading, nigrescent, entire, acute at the apex, glabrous; peduncles rigid, 11.5--60 cm. long, deeply 5-angled and -sulcate, glabrous; heads subglobose, truncate at the base, conspicuously white-powdery; involucre bractlets obovate or elliptic, rather flat, fuscous-stramineous, rounded at the apex, rather shiny, glabrous; receptacular bractlets broadly rhomboid-cuneate, surpassing the florets, closely imbricate, pale fuscous-olivaceous, rather acutish at the apex, rather shiny, inflexed at the apex and there conspicuously white-powdery on the outer surface, but this pulverulence easily rubbing off; staminate florets: short-stalked, flattened; sepals 2, broadly navicular-carinate, stramineous-whitish, rounded at the apex, glabrous, rather shiny, the keel narrowly alate, often 1-toothed at the middle on the back, the tooth ascending and acute; petals 2, connate into a slender tube which is slightly thickened above, glabrous, its limb 2-lobed, the lobes ovate-lanceolate, non-glanduliferous, barbellate at the apex, the anterior one somewhat longer; stamens 4, inserted at the apex of the corolla-tube, 2 opposite each corolla-lobe and adnate to it; anthers didymous-subrotund, gray or olivaceous-black; pistil-rudiments 2, in the center of the top of the corolla-tube, subclavate, black; pistillate florets: short-stalked, flattened; sepals 2, approximate, inserted beneath the ovary, lateral, broadly navicular-carinate, pale-olivaceous, narrowed and somewhat recurved toward the apex, obtuse at the apex, rather shiny, glabrous, closed together in fruit, the keel dorsal and alate, the wing rounded, ciliate, with easily rubbed-off very short rather thick white hairs, finally rather spongy-thickened; petals 2, shorter, linear, hyaline, non-glanduliferous, barbellate at the apex, the anterior one slightly larger; ovary sessile, subrotund, 2-celled; style elongate; stigmas 2, simple, subulate; fruit subrotund, 2-seeded, membranous, brownish; seeds subglobose-elliptic, rounded at both ends, bright-brown, rather shiny, tuberculate at the hilum, conspicuously covered with short truncate weak hyaline hair-like cellular growths in many longitudinal lines.

This species apparently occurs from Madagascar (the type locality) and Mauritius through Ceylon, the Andaman Islands, and Burma, to CochinChina, Pahang, Malacca, and Singapore, northward into China, Hongkong, and the Philippine Islands and eastward to the Caroline Islands, Labuan, Borneo, Sarawak, and the Sunda Islands. Superficially plants of this species are very similar to those of E. sexangulare L. and are distinguished from them with the utmost difficulty unless the flowers are dissected. Hooker (1893) reduced the taxon to varietal status under E. sexangulare, and Fyson (1921) has gone so far as to unite them completely under the latter name, maintaining that they comprise merely one variable taxonomic entity. He admits, however, that in India, at least, they each have a different geographic area of greater abundance. Ruhland, the most recent monographer of and expert on the family (1903), considers the 2-merous character of the florets of E. willdenovianum (which he calls E. longifolium) so important taxonomically and so distinct from the 3-merous florets of E. sexangulare, that he places the two species in widely separated sections of the genus, -- a disposition which Fyson ridicules.

Van Royen's (1959) description of the species should also be repeated here for comparison with the one given above: "Herb up to 65 cm, often viviparous. Leaves linear, 8--40 by 0.2--0.9 cm, mucronate or obtuse, many-nerved, fenestrate, glabrous. Peduncles 15--65 cm, twisted, 4--6-nerved, glabrous, sheath 3--12 cm. Heads globose, obovoid to ellipsoid or cylindric, 2.5--8.5 by 2.5--7 mm, involucre bracts broadly ovate or obovate, 2--2.5 by 2--2.5 mm, obtuse or subacute, glabrous, floral bracts obovate or panduriform-cuneate, 2.5--3 by 2.5--3 mm, rounded and acuminate, whitish puberulous at outside in the apical part, dark brownish in the apical half; receptaculum glabrous. ♂ Flowers: sepals 2, tubuliformly united, boat-shaped, 2--2.5 by c. 1 mm, crested in the apical part, glabrous; petals 2, rarely 3, tubuliformly united, with (sometimes without) a black gland, whitish puberulous at apex; stamens 4, anthers black. ♀ Flowers: sepals 2, boat-shaped, 2--2.5 by c. 1.5 mm, broadly winged and coarsely dentate, glabrous; petals 2, linear, c. 2 mm long, with a black gland at apex, some hairs along apical part of margin and at apex; ovary 2-celled; style 1 with 2 branches. Seeds ellipsoid, slightly oblique, with longitudinal rows of hairs. Distribution. Mauritius, Madagascar, Ceylon, Andamans, continental Asia, Honkong, Malay Peninsula to New Guinea. Local distribution. Until now it has not yet reported from the Territory and from Papua but only from Netherlands New Guinea (Anta 30 in BO, Van Royen 4501, 4838, 4909 all in L.). Ecology. This species is found growing in humid plains and marshes at low altitudes up to 300 m."

Still later, Backer & Bakhuizen van den Brink (1968) describe the plant as follows: "All leaves in a radical rosette. Terrestrials. Interfloral bracts in their upper halves or on their tops with numerous short white hairs. Involucre bracts, peduncles, and leaves glabrous, heads less than 8 mm across. Larger leaves 12--30 cm long. Heads globose or ellipsoid, hard, 5--8 mm long, bluish

grey; interfloral bracts very dark-coloured, very obtuse, apically clothed with very minute white hairs; involucre bracts of old heads widely patent; receptacle glabrous; peduncle 15--80 cm, often much twisted; sepals 2, navicular, pale, glabrous; petals 2, pubescent, below the top whether or not with a gland; ♂: anthers 4, very dark-coloured; ♀: style-arms 2. 0.15--0.80; erroneously reported to have been collected long ago near Ambarawa (C)."

The species has been found growing in ditches, at altitudes of 10--300 meters, flowering and fruiting in January, May, September, and December. Brass describes it as "plentiful under cover of swamp grasses and sedges.....common on sour savanna slopes and wet grass plains.....common among grass on hummocks of wet savanna plains.....abundant on wet flats.....common in damp situations on savannas....[and] plentiful in shallow margins of small swamps on savannas" in New Guinea. Van Royen's statement that it is not known from Papua is now not true, since this is where Brass found it in such abundance.

There is much confusion and diversity of opinion about this taxon. Thwaites & Hooker (1864) place it (as E. longifolium Nees) in the synonymy of what they call E. wallichianum Mart. (now known as E. sexangulare L.). It is certainly very similar in habit also to E. australe R. Br., but cannot be conspecific with the latter, since this, according to Ruhland (1903), is a trimerous species.

The name, Eriocaulon longifolium Nees (1841), is invalidated by E. longifolium Raf. (1840), a validly published binomial now regarded as a synonym of the eastern North American E. decangulare L. Eriocaulon longissimum Nees is not recorded in the Index Kewensis and was not validly published under the present edition of the Rules of Botanic Nomenclature. Usteri (1905) merely says: "973. Eriocaulon longissimum Nees. Jaré am Ufer eines Meerarmes bei Jlo-Jlo" and "Bestimmt von Herrn C. B. Clarke in London". It seems obvious that the specific epithet used here is merely an error for E. longifolium Nees. Usteri's binomial is at best a hyponym and does not invalidate the use of the name E. willdenovianum for this taxon.

Kunth (1841) cites Herb. Willdenow 2359, in part, "Eriocaulon e Madagascaria Willd. herb. n. 2370", and Chapelier s.n., also from Madagascar, as the material on which the species is based -- although he also states that his description is drawn from only two of these collections, the major portions from the Chapelier collection (which, if any of the three is to be designated as type, probably is the one that should be so regarded). His words regarding the Herb. Willdenow material are: "specimen intermedium plantam juvenilem offert, sinistrum (pedunculus capitulifer) vero fortasse aut ex eadem stirpe carptum, quam cel. Nees ab Esenbeck sub n. 2370 suppetit; sepala interiora tamen prioris". Regarding his lengthy description of the species he says "Descr. secundum specimen Chapelier, ea seminum juxta specimen Willd. n. 2370".

STUDIES IN THE EUPATORIEAE (COMPOSITAE). XXVII.

A MONOGRAPH OF THE GENUS, TRICHOCORONIS

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The genus Trichocoronis is presently recognized as consisting of two species of Mexico and the Southwestern United States. A third species (Trichocoronis rivularis A. Gray) has recently been transferred to a new genus, Shinnersia (King & Robinson, 1970).

Trichocoronis A. Gray, Mem. Am. Acad. n.s. 4: 65. 1849.

Margacola Buckley, Proc. Acad. Sc. Phila. 457. 1861.

Biolettia E. L. Greene, Pittonia 2: 216. 1891.

Inflorescence monocephalic to laxly branched; heads 75-125 flowered; receptacle convex to conical; corolla tubular above, sharply constricted below; lobes about as long as broad; pappus of 2-6 short setae; achenes prismatic, 4-5 ribbed; carpopodium distinct, tapering, of small isodiametric usually thick-walled cells.

Type species Ageratum wrightii A. Gray.

Key to the species of Trichocoronis

- 1a. Inflorescences sparingly branched; peduncles slender; heads ca. 5 mm wide T. wrightii
- 1b. Inflorescences monocephalic; peduncles slightly incrassate; heads ca. 1 cm wide. T. sessilifolium

Trichocoronis wrightii (A. Gray) A. Gray, Mem. Am. Acad. n.s. 4: 65. 1849.

Ageratum wrightii A. Gray, Proc. Am. Acad. 1: 46. 1848.

[UNITED STATES: Texas: without precise locality, low places in the prairies along the Colorado River above Columbus, Wright (Holotype GH!).]

We recognize the following two varieties.

Trichocoronis wrightii (A. Gray) A. Gray, var. wrightii

Margacola parvula Buckley, Proc. Acad. Sc. Phila. 457. 1861 (1862). [UNITED STATES: Texas: Refugio Co.: near Refugio, May 1860, Buckley s.n. (Holotype ANS!).]

Biolettia riparia E. L. Greene, Pittonia 2: 216. 1891.

[UNITED STATES: California: San Joaquin Co.? "along the

banks of the lower San Joaquin River", Bioletti s.n.
(Type not seen¹).

Trichocoronis riparia (E. L. Greene) E. L. Greene, *Erythea*
1: 42. 1893.

Small ascending herb to 30 cm tall, not or sparingly branched. Stems faintly striate with rather long eglandular hairs. Leaves sessile, opposite below, becoming alternate above; blades thin, oblong, up to 2.5 cm long and up to 1 cm wide, rather palmately veined; margin serrate; apex acuminate with few long eglandular hairs on both surfaces. Inflorescence scarcely to considerably laxly branched. Heads 4-5 mm high, 75-100 flowered. Phyllaries in 2-3 series, subequal, green at base becoming maroon toward apex, ca. 30, with 3-4 striae, glabrous, apex acute. Receptacle convex to conical, rather warty, naked. Corollas tubular above, sharply constricted below, 1.0-2.0 mm long, lower portion of the throat white, upper portion of the throat maroon, lobes white. Pappus of 2-5 (6) setae, ca. 1 mm long. Achenes prismatic, brown when mature, 1.0-1.25 mm long, 4-5 ribbed, ribs setose, setae stiff, slender, of thick-walled cells. Carpodium well developed, tapering, of small isodiametric thick-walled cells, bottom row of cells very large. Pollen tricolpate, spherical, spinose, ca. 18 μ diam. Chromosome number determined as $n = 15$ (Turner, Powell, and King, 1962).

UNITED STATES: California: Colusa Co.: Davis Tule, near Sycamore Slough, Stinchfield 434 (NY); 7 mi. E of Arbuckle, Tucker 2675 (UC); 17 mi. N of Knights Landing, Nobs and Smith 1890 (UC). Merced Co.: Los Banos Wildlife Refuge, 2 mi. N of Los Banos, Nobs and Smith 160 (UC). Riverside Co.: San Jacinto Lake, near Moreno, Munz and Johnston 5541 (UC); near Beaumont, July 1911, Hasse s.n. (UC). San Joaquin Co.: near Lothrop, Oct. 1891, Brandeggee s.n. (NY). Texas: Aransas Co.: 3 mi. N of Rockport, Whitehouse 18284 (MICH, NY, US). Cameron Co.: Laguna Atascosa Natural Wildlife Refuge, Fleetwood 3598 (TEX), 7010 (TEX), Traverse 1055 (TEX), 1083 (TEX, US); Rio Hondo, Chandler 7049 (GH, NY, UC); near Almito, Lundell and Lundell 10761 (LL, MICH);

¹Apparently the type collection is not extant. The only collection made by Bioletti that has been seen by the authors is Michener and Bioletti s.n. San Joaquin Co.: San Joaquin Bridge, 9 Sept. 1892. This collection was, however, made after the species was described and cannot serve as the type. We have inquired without success of Notre Dame University where the Greene collection is housed and we wish to acknowledge the aid of C. V. Morton who checked for us at the Royal Botanic Gardens at Kew where the Bioletti collection is housed. Under the circumstances we designate the collection by Michener and Bioletti as neotype (UC).

Sarita, Lewton 185 (LL); Brownsville, Pringle 2244 (GH), Runyon 6019 (LL, TEX); 5 mi. N of Brownsville, Warren 1112 (LL); vicinity of Brownsville, Ferris and Duncan 3102 (NY). Hidalgo Co.: S of Alamo, Clover 876 (MICH). Kenedy Co.: King Ranch, Lundell and Correll 15162 (LL). Kleberg Co.: King Ranch, Johnston 5467 (TEX); Riviera, Tharp 7500 (LL, TEX). Nueces Co.: 6 mi. W of Chapman Ranch, Correll and Johnston 17794 (LL). Refugio Co.: 5 1/3 mi. SE of Austwell, Cory 48949 (GH, NY); 7.5 mi. E of Refugio, Wilkins 9781 (PH). Willacy Co.: W of Raymondsville, Clover 1770 (LL, MICH).

MEXICO: San Luis Potosí: El Naranjo, municipio de Ciudad del Maíz, Rzedowski 7319 (ENCB). Tamaulipas 60 mi. S of Matamoros, LeSueur 515 (F, TEX); 24 mi. N of San Fernando, Crutchfield and Johnston 5340 (LL, MEXU, TEX, UC); Victoria, Tharp 2602 (LL, TEX, UC); Villa Juárez, Perkins and Hall 3509 (F); 2 mi. NE of Altamira, King 4034 (F, NY, TEX, UC, US).

Trichocoronis wrightii var. wigginsii R. M. King and H. Robinson, var. nov.; a *T. wrightii* differt statura majore, floribus 100-125, carpodiorum cellulis minus incrassatis. [MEXICO: Baja California: Llano de Caquhui in Sierra de la Giganta, W of Los Dolores. Lat. 24 56 N, Long. 110 52 W, 17 Nov. 1959, Wiggins 15533B (Holotype DS!)]].

It is a pleasure to name this somewhat distinctive geographically isolated entity for Dr. Ira L. Wiggins of Stanford University. Dr. Wiggins' collecting and writings have added greatly to our knowledge of this part of Mexico.

Trichocoronis sessilifolia (Schauer) B. L. Robinson, Proc. Am. Acad. 32: 35. 1906.

Ageratum sessilifolium Schauer, Linnaea 19: 715. 1847

[MEXICO: without precise locality, Aschenborn 4 (Type B, destroyed²)].

Trichocoronis greggii A. Gray, Smiths. Contr. Knowl.

3: 89. 1850. [MEXICO: Michoacán: low dry plain E of Zipimeo, 11 May 1849, Gregg 807 (Holotype GH!, isotypes MO! NY!)]].

Small ascending to erect herb, up to 30 cm tall, unbranched. Stems faintly striate, with rather long eglandular hairs. Leaves sessile, opposite, somewhat thicker than *T. wrightii*, oblong, up to 2 cm long and up to 1 cm wide, rather palmate-veined; margin

²Since the type at Berlin has been destroyed and since there is no evidence of duplicates elsewhere, we select as neotype the Gregg 807 from Mexico which is the holotype of *T. greggii*.

serrate, apex acuminate with a few long eglandular hairs on both surfaces. Inflorescences monocephalic, peduncles slightly incrassate. Heads 4-5 mm high, ca. 125 flowered. Phyllaries in 2-3 series, subequal, greenish, becoming maroon toward the apex, ca. 30, with 3-4 striae, glabrous, apex acute. Receptacle conical, rather warty, naked. Corollas tubular above, sharply constricted below, ca. 2.5 mm long, lower portion of throat white, upper portion of throat maroon, lobes white, with a few septate eglandular hairs on the back. Pappus of 2-5 setae, ca. 0.5 mm long. Achenes prismatic, dark brown when mature, ca. 1.25 mm long, 4-5 ribbed, ribs setose, setae stiff, slender, of thick-walled cells. Carpopodium well developed, tapering, of small isodiametric thick-walled cells, bottom row of cells very large. Pollen tricolpate, spherical, spinose, ca. 18 μ diam. Representative specimens examined:

MEXICO: Federal District: Valley of Mexico, Pringle 7450 (F, MO, US). Jalisco: Marshes of Atequiza, Pringle 3110 (ENCB, F, G, GH, LL, MEXU, MO, ND-G, NY, UC, US). Michoacan: vicinity of Morelia, Arsène 8448 (MO, US).

Literature Cited

- Turner, B. L., A. M. Powell, and R. M. King. 1962. Chromosome numbers in the Compositae. VI, Additional Mexican and Guatemalan species. *Rhodora* 64: 251-271.
- King, R. M. and H. Robinson 1970. Studies in the Eupatorieae (Compositae) XII. A new genus Shinnersia. *Phytologia* 19: 297-298.

CONTINUING STUDIES IN THE GUTTIFERAE

Bassett Maguire¹

During a recent field trip in Ecuador, made on behalf of my studies in the Guttiferae, my wife and I observed many individuals of an extraordinarily remarkable and handsome species of the large and complex genus Clusia. We made no fewer than six collections, including both sexes, represented in each collection by a rather extensive series of this fine epiphyte, because of its inherent interest and because at that time we believed it to be undescribed.

Upon return to New York in December (last) we immediately, with the assistance of Mr. Charles Clare, staff artist at The New York Botanical Garden, and Mr. Yung-chau Huang, technologist working with us, began detailed studies of the species in question. Then only, under the authorship of Elbert Little in volume 19 of Phytologia, published in January 1970, we read the description and discussion and saw illustrations of this "new" Clusia.

Dr. Little provided a most adequate diagnosis and description, accompanied by illustrations (Phytologia 19: 262-267, January, 1970) for it, under the name of Clusia venusta. There is not now appreciable to add except some additional record, observation, and the presentation of the excellent plates prepared by Mr. Clare and photographs of pollens prepared by Mr. Huang.

Dr. Little has been good enough to share his valuable collections, and I now have before me specimens of his No. 20450, an isotype of C. venusta, and Little & Dixon 21054 of that species. These together with the following exsiccatae seem to represent the now known collections:

ECUADOR. Bolívar: arbol de flores llamativas, petalos blancos, pero al apice rosado, hojas elipsoidales, Limon, estrivaciones inferiores de la Cord. Occ., 800 m, 22 Obre 1943, Acosta Solís 6469 ? (F). Esmeraldas: Bejuco leñoso comun en los arboles, petalos rosados o rojizos, bosque humedo primario, Río Hoja Blanca con Río Hualpi, alt 75 m, 14 Sept 1965, Little & Dixon 21054 (NY); parasite liana strangler becoming a tree, common, Agua Clara, Ronca Tigrillo, between Río Esmeraldas and Río Canande, 21 Aug 1967, Jativa & Epling 2253 ? (NY); liana

¹ These studies in the field, and at The New York Botanical Garden, are in large part supported by National Science Foundation Grant GB-5953X.

to 10 m, Estero Capuli, 150 m, 3 July 1966, Jativa & Epling 1058 ? (NY). Pichincha: flowers white, at 1000 ft, 20 km w of Santo Domingo, 1 Nov 1961, Cazalet & Pennington 5233 ? (NY); epiphytic (very large) shrub on small tree, Rio Baba, 28 km s Santo Domingo, 3 Nov 1961, Dodson & Thien 1179 ♂ (NY, WISC); bejuco lenoso 6 m, 8 cm diam, bosque humedo, Santo Domingo de los Colorados, 620 m, 27 Feb 1965, Elbert L. Little 20450 (isotype, NY); large shrubby epiphyte lodged at 10 m on trunk of tall palm, latex clearish white, flowers white, solitary, axillary or terminal, 12 km below Santo Domingo at 700 m alt, 29 Sept 1969, Maguire & Maguire 61786 ?; as above, but with red flowers, androecium convex-discoid, 7-8-subacutely lobed, Maguire & Maguire 61787 ♂; large shrubby epiphyte on broad-leafed trees, latex clearish white, petals white, 7, urnulately expanded, in pasture 9 km below Santo Domingo on road to Quininde, at 650 m, 2 Oct 1969, Maguire & Maguire 61790 ?; as above, but 10 km below Santo Domingo on road to Quininde, Maguire & Maguire 61791 ?; large shrubby epiphyte on palm at 10 m, latex scanty, clearish white, androecium pentagonal, 5 cm at largest diam, petals fleshy, 5-6, very deep rose, not expanded in anthesis, margins strongly crisped, in pasture, km 11, Santo Domingo-Quininde road, 650 m alt, 2 Oct 1969, Maguire & Maguire 61795 ♂.

The Maguire & Maguire collections were distributed under the epithet "acostana."

With the more ample material now available, it is possible to amplify to some extent Dr. Little's report.

Ecology and Geography: The present record of C. venusta from the Province of Bolívar extends its range southward in the amount of 150 km, thus establishing a natural range along the Pacific slopes between approximately 100 and 700 meters altitude, in areas of ample rainfall, from northern Esmeraldas to central Bolívar, Ecuador.

Some of the data on specimen labels ascribe the species to primary forest. I have seen it only in secondary areas, predominantly open pastures where maximum light is available. Hosts in such habitats may be palms or a variety of exposed broad-leafed trees.

Habit: It would seem that Clusia venusta invariably establishes itself as an epiphyte, becoming vigorous, robust, and bushy, often overgrowing the host. At length, after the destruction of the host, the epiphyte may and often does become independently established, and then may become a large, multi-stemmed, round-crowned tree 10-15 m high.

Morphology and Anatomy: Little's full description of this fine species is entirely adequate, there being few minor

discrepancies between his observations and my own. As example, he describes the latex yellow, the petals of the staminate flower to be 8, of the pistillate flower 10-11, and the carpels and stigmas 17-21. My findings respectively are: latex consistently clear becoming sugary on drying; staminate petals 5-6; pistillate petals 7-8; and carpels and stigmas 16-18. The ovary is surrounded at the base by a fleshy stamino-dial ring about 1 cm high. These differences are trivial and in no way impair the original circumscription. The character of the latex, however, is important as a sectional distinction.

Pollen: Pollens in Clusia venusta are, as commonly in the genus as a whole, 3-colporate, suboblate-prolate. The sporoderm is alveolate-reticulate. Polar view diameter is 30-37 u, equatorial measurements are 27-31 u.

The more useful contribution of this report is the presentation of Mr. Clare's fine drawings and Mr. Huang's excellent photographs of the competently prepared pollens.

Clusia dixonii Little, Phytologia 18: 469-470, fig. 15, 1969. This splendid tree Clusia, previously reported by the type collection Dixon 263, Rio Guayllabamba, Pichincha, Ecuador, may now be further recorded as follows:

ECUADOR. Pichincha: Tree 15 m high, latex scanty, cream, stigmas normally 8, appressed, concave, each carpel longitudinally several-sulcate, inflorescences 1-3-fruited, at 1600 m alt in pueblo of Tandapi, overhanging Rio Toachi, 54 km above Santo Domingo de los Colorados, 26 Sept 1969, Maguire & Maguire 61778; tree to 10 m high, 20 cm diam, ♀, flowers normally solitary or inflorescence of 3, latex scanty, whitish, at 1050 m alt, overhanging Rio Toachi, 10 km below Pueblo Tandapi, along road to Santo Domingo de los Colorados, 27 Sept 1969, Maguire & Maguire 61781; tree 15 m high, latex scanty, cream-white, sepals 7-8, not opposite, carpels normally 8, deeply sulcate, each carpel in turn vertically 3-4-sulcate, stigmas appressed, lanceolate, concave, on rocky slopes at 1550 m alt, 20 km above Santo Domingo de los Colorados, 27 Sept 1969, Maguire & Maguire 61785; tree 10 m high, ♀, latex cream, moderate, fruit - stigmas commonly 8, carpels deeply sulcate, each carpel dorsally additionally 3-sulcate, frequent at 1300 m alt, 50 km above Santo Domingo along Rio Toachi, 4 Oct 1969, Maguire & Maguire 61799; tree 10 m high, latex cream, moderate, ♀, petals cream-tan, oblanceolate, fruit - stigmas commonly 8, carpels deeply sulcate, each carpel dorsally additionally 3-sulcate, frequent at 1350 m alt, 50 km above Santo Domingo along Rio Toachi, 4 Oct 1969, Maguire & Maguire 61800.

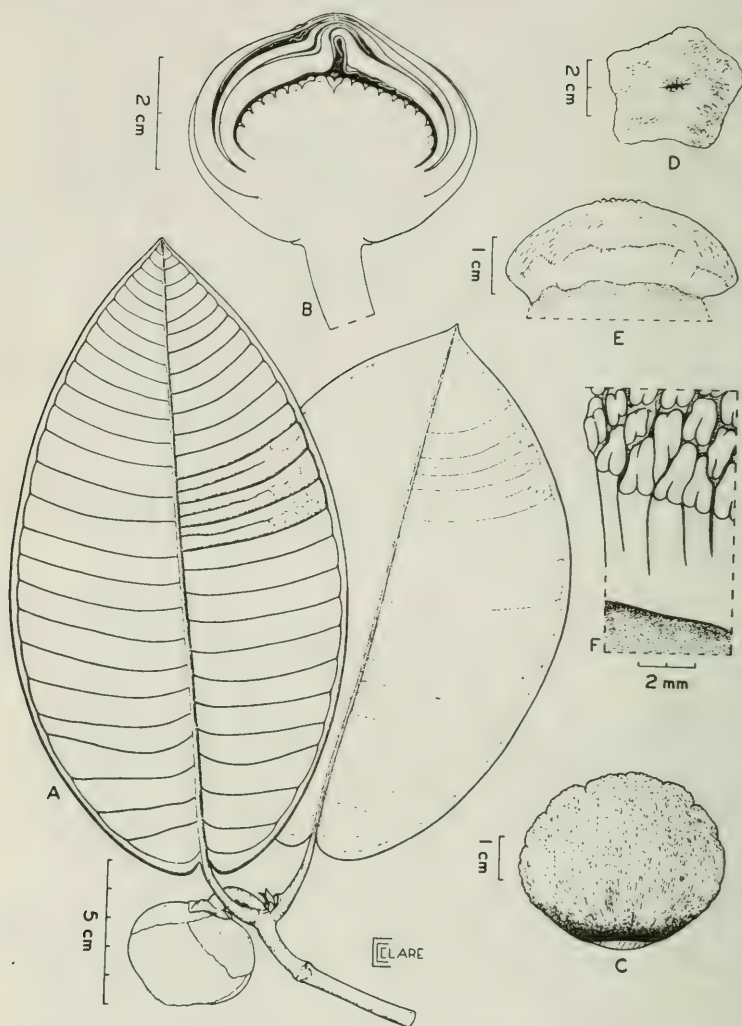


Fig. 1. *Clusia venusta*. A, Habit, Maguire & Maguire 61687; B, Median long-section of staminate flower bud, Maguire & Maguire 61795; C, Petal, Maguire & Maguire 61795; D, Top view of androecium, Maguire & Maguire 61795; E, Side view of androecium, Maguire & Maguire 61795; F, Section of marginal portion of androecium, Maguire & Maguire 61795.

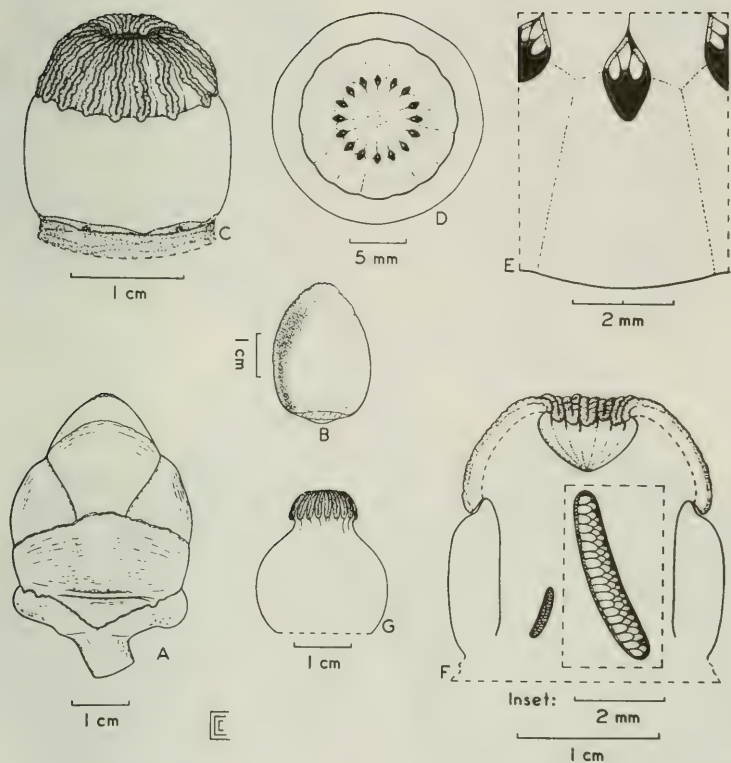


Fig. 2. Clusia venusta. A, Pistillate bud, Maguire & Maguire 61791; B, Petal, Maguire & Maguire 61791; C, Immature pistil, the ovary of which is encased in fleshy staminodial cylinder, Maguire & Maguire 61791; D, Cross-section of immature ovary with encasing staminodial cylinder, Maguire & Maguire 61791; E, Cross-section of a carpel and portion of adjacent ones, showing attachment of sessile ovules at base of which are integumental rings which at maturity envelop the seed as conspicuously colored arils, Maguire & Maguire 61791; F, Long-section of immature pistil showing relatively small locules and placental area (inset much enlarged), and staminodial cylinder, Maguire & Maguire 61791; G, Maturing pistil, Jativa & Epling 1058.

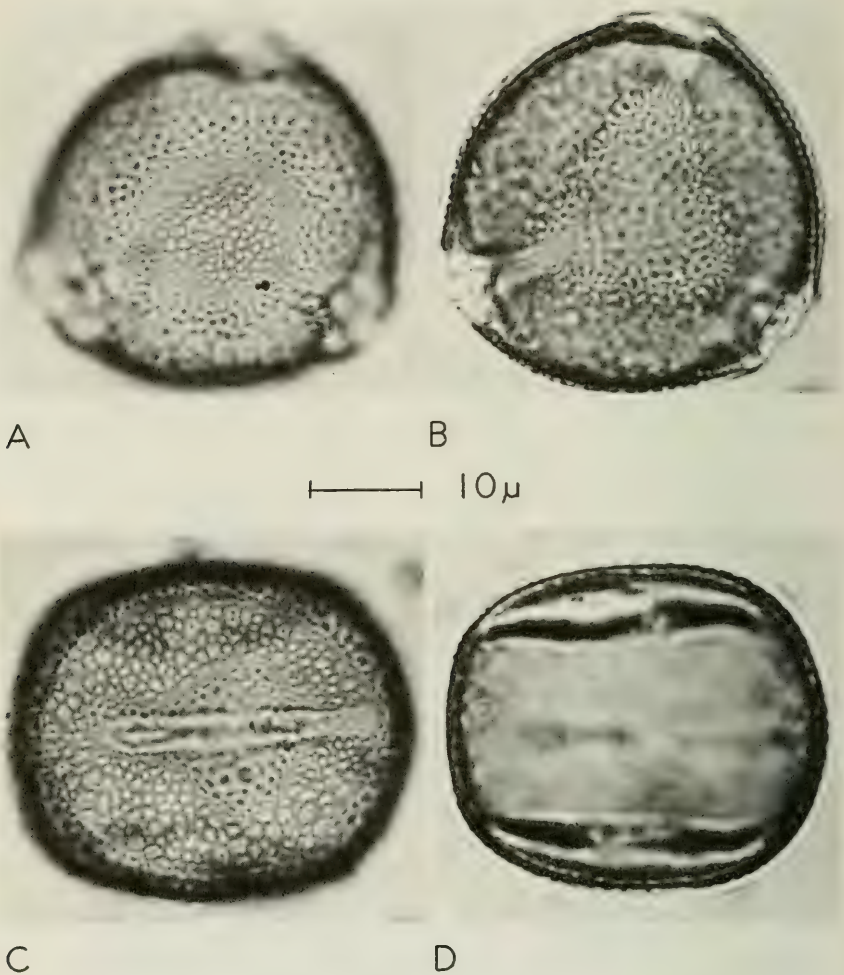


Fig. 3. Pollen of *Clusia venusta*, Maguire & Maguire 61795, x 1500 (approx.). A, Surface polar view showing alveolate-reticulate sculpturing; B, Median focus view showing sulci and walls in section (central triangular area is artifactual, resulting from a depression of spore walls); C, Surface equatorial view showing sulcus and sculpturing; D, Median focus view showing the two adverse sulci and wall in section.



Fig. 4. Clusia venusta. Photograph of ♂ specimen, Maguire & Maguire 61795.

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